Mining CONGRESS JOURNAL

THE AMERICAN MINING CONGRESS

AUGUST
1945

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26 inch LOW-LINER

The 26" Low-Liner, when applied to the widest track gauge normally found in mines can be built to the following specifications:

Track Gauge	48	inches
Wheel Base	85	inches
Frame Height	25⅞	inches
Width Over Frames	79½	inches
Length Over-all	21 ft., 1 in.	
Clearance—Rail to Frame	4½	inches
Clearance—Rail to Bumper	5½	inches
Clearance—Rail to Brake Cutout	9	inches
Clearance—Rail to Gear Case	2¼	inches
Clearance—Rail to Motor	2½	inches

The new Westinghouse "LOW-LINER" can operate in seams of a thickness formerly limited to gathering locomotives. Although it can be built only 26 inches high, important standard details of design and construction have been maintained... thus assuring dependable performance and easy maintenance.

The "LOW-LINER" has flush-frame construction for safety and ample equipment space; roller journal bearings with boxes which are removable without untracking the locomotive; leaf springs for smoother riding qualities; cross equalization for better tracking. Equipment and parts are arranged for easy access, which simplifies maintenance and inspection. For a locomotive that meets these low coal operating conditions and delivers maximum "on-the-job" haulage... it will pay you to investigate the Westinghouse "LOW-LINER".

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Westinghouse *Mine Locomotives*

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

Mining Congress Journal

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THE AMERICAN MINING CONGRESS
309 MUNSEY BLDG., WASHINGTON 4, D. C.

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Published Monthly. Yearly subscriptions: United States, $2.00; Canada and Foreign, $4.00. Single copies, $0.25. February Annual Review Issue, $2.00. Entered as Second-Class Matter, January 30, 1915, at the Post Office at Washington, D. C.

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The S-D 1-2-3 "Automatic" car meets every requirement today for more efficient use of labor in mining coal, and this means lower production costs and greater profits in the end.

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Motor and pump are built together as a single unit, rigid and compact. No special foundation is necessary—pump can be operated in any position—it doesn't have to be level.

Sling-yoke mounting readily converts it to a shaft-sinking unit, and this sling yoke does not prevent its use for other services.

The Motorpump is also suitable for many surface jobs—water supply, wash water, etc. Let an I-R engineer tell you more about them. These and other pumps are available for every mine pumping job. Ingersoll-Rand Company, Cameron Pump Division, 11 Broadway, New York 4, N. Y.

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These "warnings," which appear in Better Homes and Gardens, American Home, American Builder, Architectural Forum, American Press, and the Chicago Journal of Commerce, are only part of the Bituminous Coal Institute's campaign to win new friends and build bigger markets for the industry. Other dramatic and informative advertising and publicity campaigns directed to the general public and to industrial users of coal emphasize the merits of coal as a fuel and the importance of coal and coal by-products to the American standard of living.

This public relations campaign of the Bituminous Coal Institute is part of the unified program for progress within the Bituminous Coal Industry—a program sponsored by mine operators and designed to assure the future of every member of the industry. If you are not yet contributing to this effort, write us at the address below for additional information.

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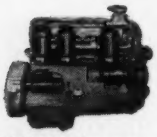
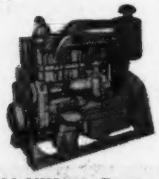


Model HB-600: Automotive engine, 6 cylinders, 4¼" x 6", 150 hp. at 1800 rpm. (maximum).



Model NHI-600: Power unit, 6 cylinders, 5⅛" x 6", 200 hp. at 2100 rpm. (maximum).

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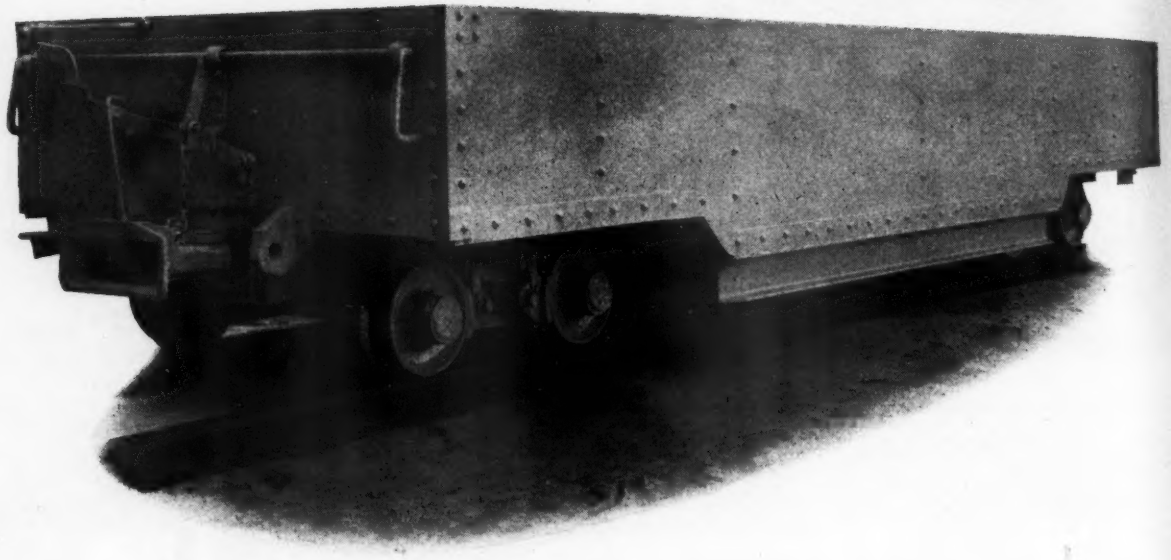
BETHLEHEM ALL-STEEL MINE CAR



What are you actually buying when you order a Bethlehem all-steel mine car?

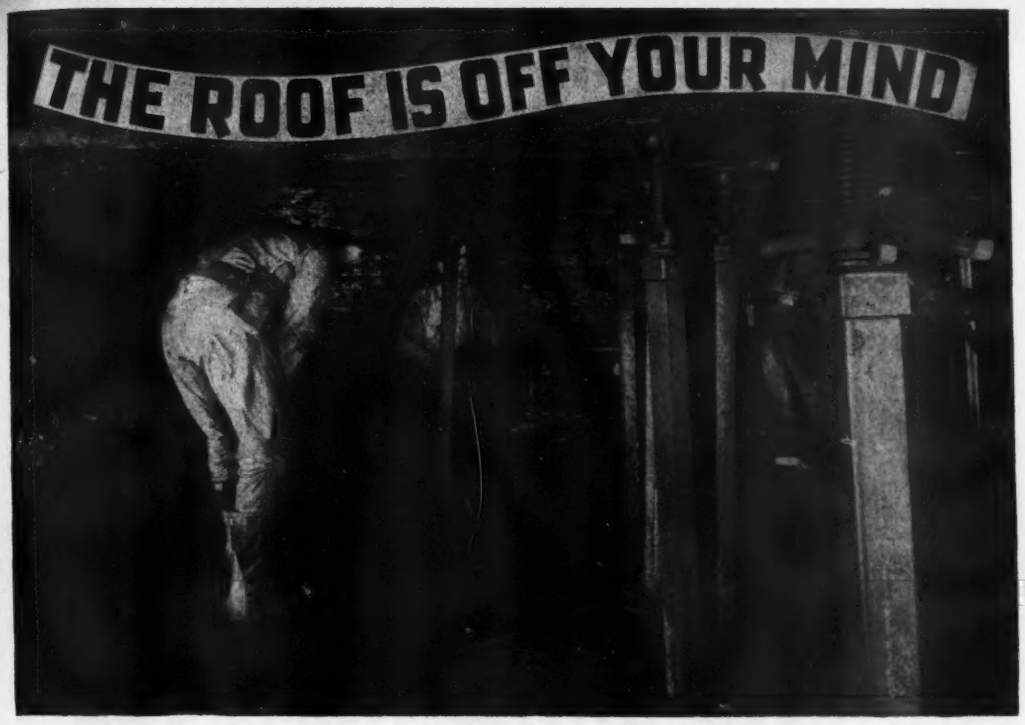
You're buying tops in durability, for no car stands up like a steel car. You're buying years of satisfactory service under tough, unpredictable conditions.

You're buying the utmost in good-running qualities, and you're hitting rock bottom in maintenance costs . . . because a Bethlehem all-steel mine car keeps rolling after other types have given up the ghost.

You're buying undivided responsibility, for Bethlehem builds all-steel mine cars from the wheels up—and stands behind the product.

And remember, Bethlehem can furnish you the kind of steel mine car you want—whether rotary-dump, end-dump, high- or low-side types. If you're interested in better haulage at lower cost, check with our engineers. They're old hands at the business of designing good mine cars.

★ BETHLEHEM STEEL ★



Simplex Mine Roof Jacks at the Wallace Mine of the Youghiogheny & Ohio Coal Company, one of the many progressive mining companies that play safe with Simplex Jacks.

Simplex No. 32 Combination Mine Timber Jack and Post Puller. Ratchet Lever Type; 5-ton Capacity.

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M8 (8-ton capacity) and M16 (16 tons) Mine Roof Jacks are easily and quickly set in place where tender draw slate or other soft tops present a hazardous roof problem. The working face is better protected by these speedy, inexpensive jacks. They are also widely used as temporary supports under cross timbers, steel beams or steel rails, and for holding conveyors in place. They allow loading machines and conveyors to work in less space. Painted aluminum color for better visability. M8 and M16 are available with heads for any type of roof supporting member and are furnished with square tubing. M9 and M17 consist of screw assembly and base only for your own round pipe. Send for Catalog No. 44.

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LEVER · SCREW · HYDRAULIC
Jacks

Better Coal Preparation, accomplished by Modern Mechanized Equipment, pays Operators <u>double</u> dividends.

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These facts were so appreciated before the war that about ⅓ of all the mines in this country had already mechanized—below and *above* ground. Now, with coal production high on the priorities list, it is again possible for operators to equip for lower cost, better preparation—to meet returning *competitive conditions*.

MORROW ENGINEERS are available now to design and equip more efficient preparation plants. Ask Morrow to assign an engineer to study your situation. Write The Morrow Manufacturing Company, 1983 Ford Blvd., Wellston, Ohio. Division The Wacker Corporation.

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1. low impurity content
2. correct sizing
3. high uniformity

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"I can't raise prices— and I've got to pay the scale— what next?"

★ Making a profit is fundamental to success in the American system of business. Coal mining is recognized as a major American industry . . . it must continue to succeed. Yet, today, the above quoted statement is running through the minds of coal mine operators everywhere.

—"what next?" Solving this question is the problem. Obviously, the solution lies in more efficient use of labor . . . more tonnage per man employed.

Whaley "Automats" have, for years, been increasing the tons per man hour in coal loading and increasing the efficiency of labor in dead-work by the rapid and more efficient loading of rock in the taking of top and bottom . . . in brushing or grading, and in the cleaning up of entries, air courses, etc.

You need the long-life Whaley "Automat" now more than ever before. You need the labor-saving efficiency of the "Automat's" exclusive shoveling action. You need this machine that loads, in its stride, any lump of coal that can pass through your tipple, or any size rock your cars, aerial trams or larries can take.

We would like to go into your problems with you. When writing, please give us information on your conditions. Myers-Whaley Co., 175 Proctor Addn., Knoxville 6, Tennessee.

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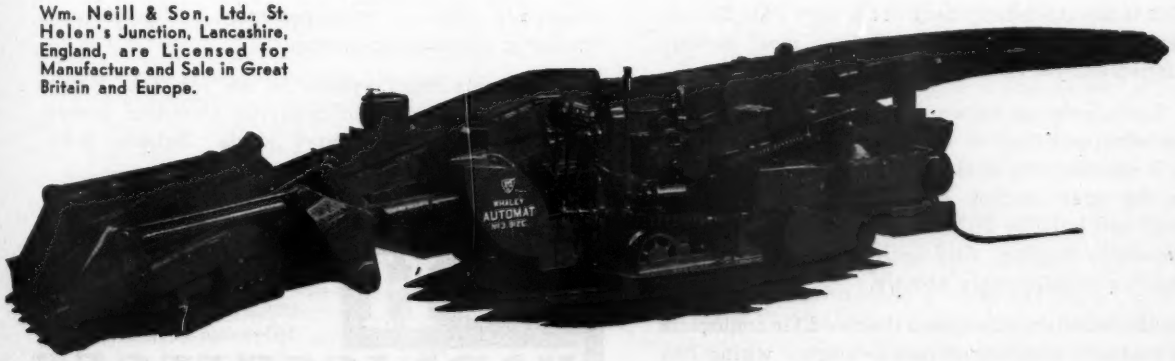
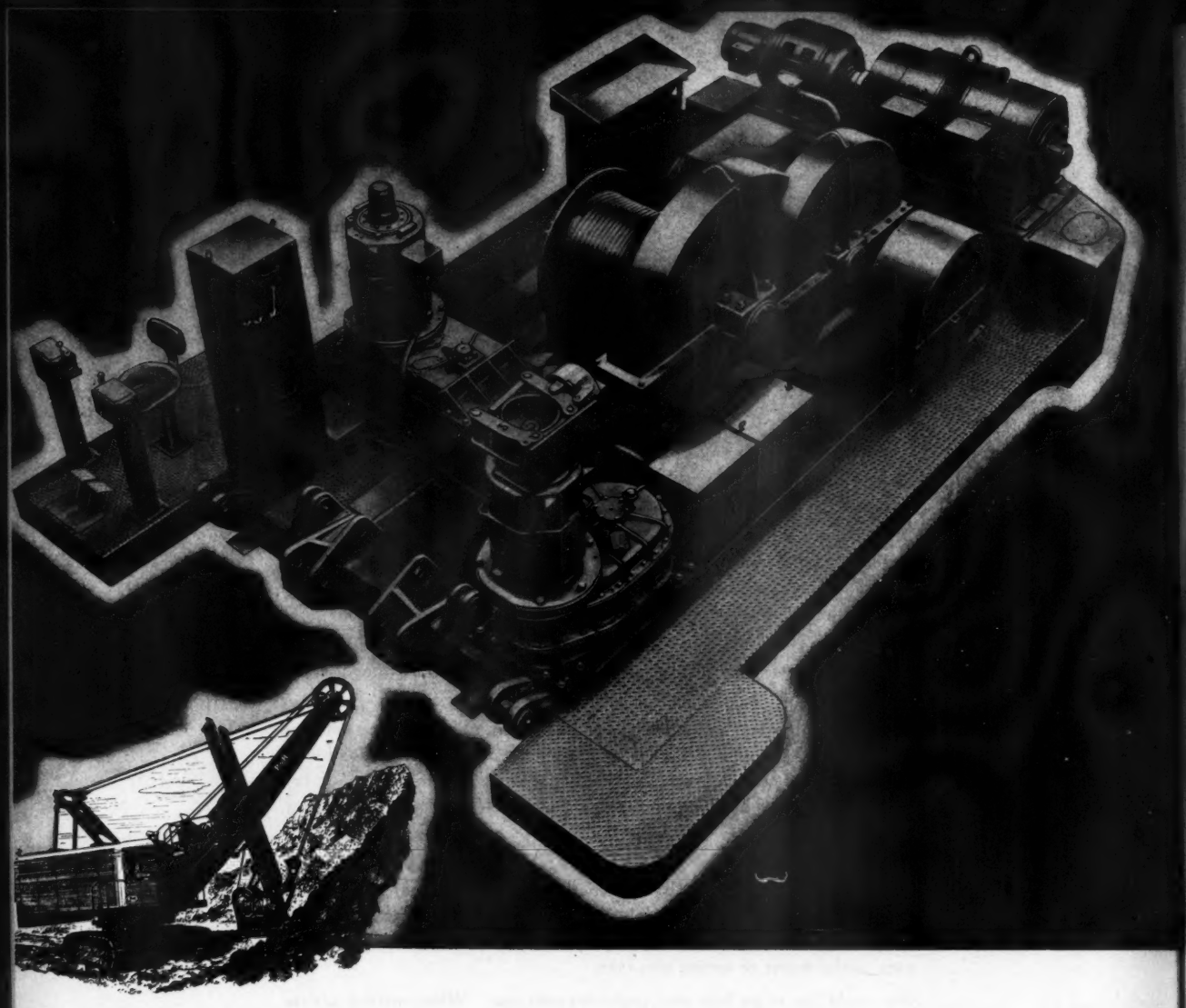


★ MYERS-WHALEY

Mechanical Loaders Exclusively For Over 37 Years



Giving Kilowatts a New Incentive

● This is the machinery deck of the new P&H Electric Shovel—the simplest, most efficient, most modern arrangement yet devised.

But this is only an outward indication of one of its most vital qualities — *higher electrical efficiency.* This is no assembly of electrical equipment gathered from the open market. All electrical units are *designed* and built by P&H for one specific purpose — dependable digging. And each unit is built to meet its service requirements *exactly.*

Simplification has eliminated the need for contactors and contactor control cabinets — electric wiring has been reduced more than 40%. And, since all equipment on the machinery deck remains in place during shipment, there is no opportunity to "botch up" wiring or circuit connections.

This finer electrical system is the result of P&H's sixty-year leadership in applying electrical power to the movement of heavy loads. Bulletin X-83 describes it.

P&H

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Mining CONGRESS JOURNAL

Published for the Entire Mining Industry by The American Mining Congress
S. A. TRENGOVE, Editor

Volume 31 AUGUST, 1945 Number 8

Wanted—Miners!

THE coal industry, seeking to counteract a combination of difficult situations, has put in its bid to the War Department for miners. It asks release from the armed forces of some ten thousand experienced coal miners who, on the basis of the Army's point discharge system, are eligible for return to civilian life. And it requests furlough of some twenty thousand others still in this country.

The plea of the mines is based on least possible disruption of strictly military plans. It has strong support in Congress and from the Office of the Solid Fuels Administration for War, largely predicated on imminent coal shortages at home as well as extreme needs in Western Europe this winter.

Retarded on nearly every hand in its effort to meet coal requirements, American coal mining might long since have uttered a weary "what's the use" and squatted resignedly on its haunches. But free enterprise doesn't do things that way! Instead, it continues to look for changes for the better.

We cite recent encouraging signs: more meat for miners; indication of retaining present miners through help of Selective Service; and continued diligence of WPB's Mining Division and manufacturers of mining machinery and supplies in seeing that the mines are adequately served. OPA has announced upward readjustments of the price structure in certain districts, but these fall far short of providing adequate relief. Progress made has resulted only from persistent demonstration of the importance of these measures to the war effort itself.

The ills arising out of such circumstances as OPA's long drawn out obstruction to adequate compensation for coal production; concurrent "wildcat" strikes (netting over a 12-million ton loss since the significant date of April 1); the dwindling productive capacity of over-age miners, and predicted coal shortages at home and abroad still prey heavily on the mines. The obvious and effective cure for these maladies is, of course, *more miners—more young and vigorous men, of whom the industry has lost over 100,000 since 1941.*

The War Department, whose operations are closely tied in with the effects of fuel shortages here and abroad, would do well to release the men sought. Virtually a "handful" of men, as armies go nowadays, could avert distress at home as well as severe consequences in Western Europe. What better redeployment for these men than putting them where they can best help alleviate the tough job which now lies ahead for Allied Control officers and troops!

Objections based on such policy considerations as not disturbing the point discharge system, or not using the army as an aid to labor draft, seem puny and insignificant compared with the consequences which can otherwise take place. The War Department has the power to rectify the situation and it is hoped that it will see fit to use this power *NOW, BEFORE IT IS TOO LATE!*

Toward Sound Fiscal Policy

THE Tax Adjusment Act of 1945, recently made law, speeds up refunds and credits to which industry is entitled but which it would not have received for several years without this new legislation. $5.7 billion now becomes available as an aid to early reconversion, and the action is seen as the first of several steps in a new tax program designed to be favorable to productive enterprise.

Secretary of the Treasury Vinson is expected to direct his efforts toward reduced taxes for industry. He recently stated, "I regard the modernization of our tax structure as the foundation of our entire program to reach and maintain full employment after the war." New tax legislation expected to precede the 1946 elections will presumably incorporate a number of constructive changes, and industry should benefit accordingly.

We note that any view which implies or favors reduced taxes is obviously of special comfort to the Joint Committee on Reduction of Nonessential Federal Expenditures. Considerable credit is due this group for calling public attention to an epidemic of zealous government spending.

Senator Byrd has repeatedly pointed out the billions of dollars of taxpayers' money being squandered in duplication, over-staffing and sheer wasteful practices in the Federal set-up. He recently cited a growth from 521 component parts of government in 1932 to 1,141 in 1944 with a contemporary increase of 435 percent in number of employees. His Committee has been hard at work on a remedy and will soon submit to Congress a plan for complete reorganization of the executive branch of the Federal government, which if adopted, could be expected to result in substantial savings.

Indications of early improvement in Federal financing hearten us, particularly Congress' increasing concern over the matter. The spending psychology which has grown up in government badly needs change and the chairmen of both House and Senate Appropriations Committees are seeking ways to cut expenditures. It is earnestly to be hoped that we may soon see not only a cessation of the wild extravagances of recent years but an actual end to the "deficit financing" which carries such serious threats to the credit of the United States!

Difficult Mine Water Problem Solved At Mascot

American Zinc Company Successfully Employs Flotation Tailings and Cement Grout to Seal a Crevice Yielding a Flow of 4,000 g.p.m. Under 175 Lb. Pressure

By M. J. LANGLEY
Assistant Superintendent of Mines
and
GLENN HURST
General Mine Foreman, No. 2 Mine

THE zinc sulphide ore mined by the American Zinc Company of Tennessee at Mascot, New Market and Jefferson City, Tenn., occurs in the recrystallized and brecciated dolomitic limestone beds in that part of the Knox dolomite known as the Kingsport or "Jefferson City" formation. Mining has exposed numerous faults. Usually, these are of minor displacement and thickness, are dry, and filled either with fault gouge and/or secondary material. In three cases, however, faults have been cut which show vertical displacements varying from 75 to 125 ft., and all have been sources of heavy water inflow.

One of these larger faults was encountered several years ago in the face of an incline. The incline was being driven from the main haulage level in Mascot No. One Mine, on a minus 21 degree slope, and was planned to pass through and reach the low point of an orebody 150 ft. lower in elevation than the haulage level and approximately 350 ft. below the surface. The fault was cut 400 ft. down the incline and gave up water and mud estimated at 10,000 g.p.m. Pumping equipment was inadequate to handle this volume and it was necessary to close the bulkhead door at the top of the incline. This problem has not yet been solved and the incline is still under water.

Some years later a long drift was driven southwestward from the main level of Mascot No. Two Mine to enter this same orebody. This development was successful to the extent that a major portion of the orebody has been recovered. That portion adjoining the fault and incline, however, still remains in place.

Water from River Had to be Sealed Off

In December, 1943, it was decided to extend the above-mentioned drift in a westerly direction toward and into another orebody lying on the west side of the Holston River in rock beds which, when projected up dip, intersect the River.

At least two diamond drill pilot holes were kept continuously well in advance of the face of the drift. They were drilled for the purpose of showing the bedding planes and any faulting which would be cut in the drift, and in most cases the holes were drilled parallel with the drift from side stations (Figure 1). The drill was a No. 6 Sullivan and an EX bit was used. In addition to this precaution two or more 2⅛-in. diameter rock drill holes were drilled 7 ft. beyond the break of each heading.

The strike and dip of the water-bearing fault encountered in the incline development was known and this was projected westward to determine approximately where the drift might encounter the fault. After the drift had been driven 450 ft., one of the diamond drill pilot holes cut 69 ft. of fault gouge, and oxidation was indicated at both contact points of the fault planes. One hundred g.p.m. of water was flowing from this hole, which was grouted with 332 bags of cement. A Gardner-Denver 10x3x10-in. duplex high pressure air pump was used for grouting.

When the drift reached a point 20 ft. from the eastmost plane of the fault, drifting was stopped until four additional diamond drill pilot holes could be drilled. All holes cut fault gouge with some water; none, however, gave over 20 g.p.m. These were pumped full of grout, using a total of 32 bags of cement, and after a setting period of 72 hours, drifting was resumed. The top or eastmost plane of the fault was first encountered in the bottom of the drift (Figure 2). After passing through this plane and into fault gouge, it was found that the gouge was relatively soft.

Sealing at Fault Contact

Water estimated at 400 g.p.m. and under 175 lb. pressure broke out in the roof at the contact point and, before it could be brought under control, carried with it into the mine over 1,000 tons of river sand. The opening was about 18 in. long and 3 in. wide at its widest point, tapering downward at each end until the contact was sealed.

Two 2-in. pipes were partially flattened on one end and driven into the crevice. On the opposite ends of these pipes, 2-in. stop cock valves were attached. Timber wedges and shingles were then driven around these pipes into the crevice, until most of the water was flowing through the pipes and valves. To get a better seal around the wedges, pipes and rock, whole corn, crushed corn and wheat were introduced into the pump discharge line at "A" in Figure 3, and pumped through one of the 2-in. lines into the crevice.

The corn and wheat were drawn down around the wedges by the escaping water, and made an almost perfect seal. Two bags of cement grout were then pumped into the crevice and allowed to settle above and around the corn, wheat and wedging. The pump was next disconnected and valves on both pipes were opened and allowed to run for 48 hours while the cement

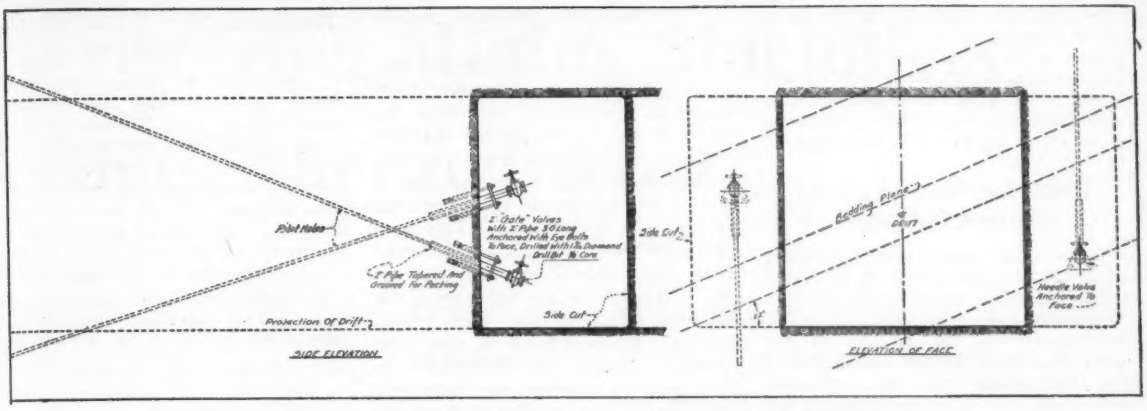
Pilot Holes
2" "Gate" Valves With 2" Pipe 30 Long Anchored With Eye Bolts To Face, Drilled With 1¾ Diamond Drill Bit 1¾ Core
2" Pipe Tapered And Grooved For Packing
Side Cut
Projection Of Drift
SIDE ELEVATION
Bedding Plane
Dip
Needle Valve Anchored To Face
ELEVATION OF FACE

Fig. 1. Side stations were cut and drills set up for pilot holes well in advance of the face

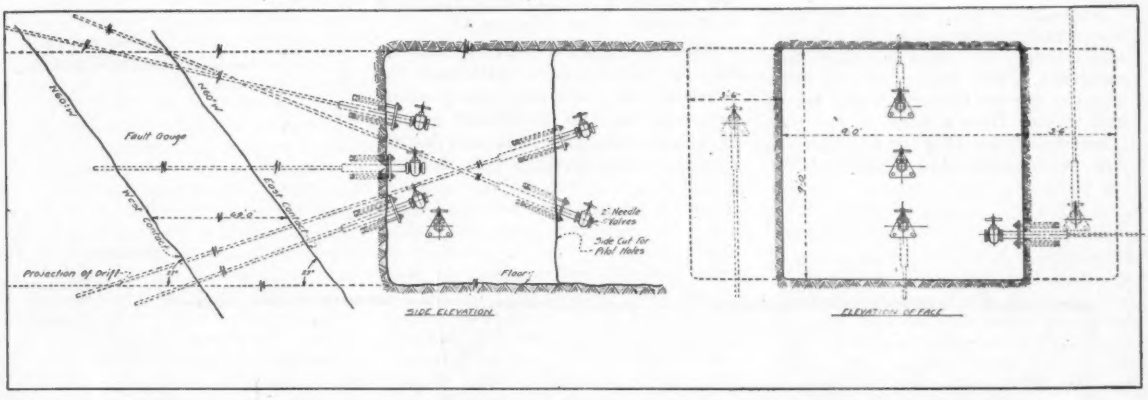

Fig. 2. The top or eastmost plane of the fault was first encountered in the bottom of the drift

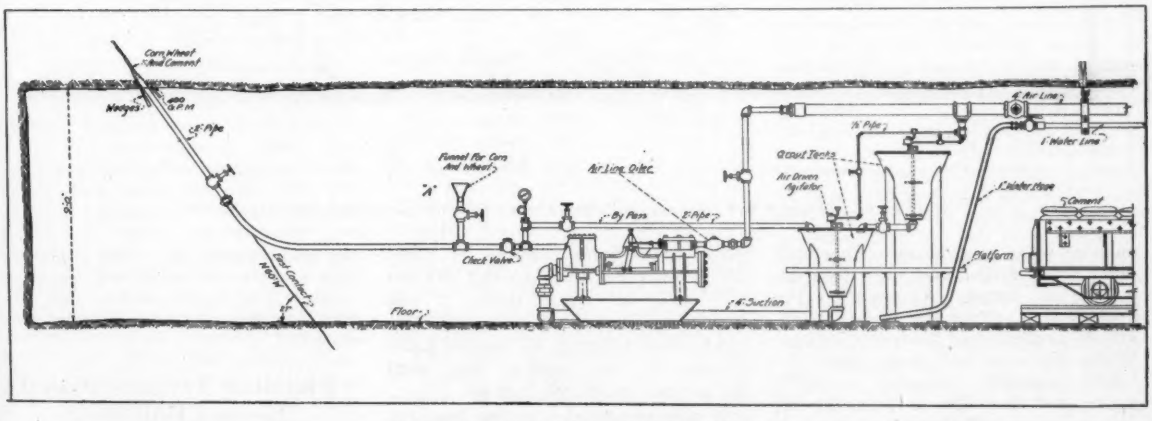

Fig. 3. Set-up for sealing crevice at east contact

was setting and before final grouting was started. The grout pump was again brought into service, as in Figure 3, and 250 bags of cement were pumped into the crevice sealing it completely.

Drifting Through Gouge

The cement grout was allowed to set for 72 hours before drifting was again resumed. As the drift was now entirely in relatively soft fault gouge, six 2⅛-in. diameter rock drill pilot holes were drilled 7 ft. beyond the break of each heading as extra insurance against striking uncontrollable water. The westmost or bottom plane of the fault had been cut and the drift extended 25 ft. beyond the fault and into normal and tight ground, when 2 g.p.m. of muddy water started flowing from a small opening in the roof of the drift at the contact point of the soft gouge and the tight ground (the westmost plane of the fault). Fearing that this small opening might enlarge, it was decided to immediately plug it with grout.

A 2-in. pipe was driven into the opening, timber wedges driven around it and grout pumped through the pipe into the crevice. After pumping 10 bags of cement, there was evidence

that the soft gouge along the fault plane was being pushed out in some places by the pump pressure. Fearing that the pressure developed by the pump might create new and probably uncontrollable avenue for the water to enter the mine, grouting was stopped.

Need for New Plugging Method Indicated

Eight hours later water estimated at 20 g.p.m. broke out in the roof at a point adjoining the original opening. The water pressure was 175 lb. p.s.i., and apparently the velocity of the water entering the drift was such that the soft gouge was being scoured away and the opening enlarged, as after 24 hours the inflow had increased to 400 g.p.m.

Attempts to plug the opening were unsuccessful because of the pressure and volume. In order to relieve this condition, it was decided to drill holes into the crevice through wheel valves and needles from a point in the roof close to the face (Figure 4), with the idea of plugging the bottom of the opening prior to grouting. Five such holes were drilled but only two encountered water. Apparently the opening 5 ft. above the roof was relatively small or had a winding course. While this work was being done, the inflow gradually increased to 2,000 g.p.m. and the idea of plugging by past methods was abandoned.

Solid Concrete Bulkhead Employed

It was decided to build a standard concrete bulkhead with hinged steel door at a point in the drift 163 ft. east from the face, to protect the drift and other workings between this point and the next bulkhead, which was located 1,200 ft. east of the heading face. Shortly after this bulkhead was started the inflow increased to approximately 4,000 g.p.m.

Fearing that the water would continue to increase and eventually reach a volume that would jeopardize the entire mine, it was decided that the building of a bulkhead with door would consume too much time and that a solid concrete bulkhead should be built in the drift immediately. This concrete bulkhead was built around three 16-in. pipes placed near the floor of the drift to drain the water past the bulkhead while it was being built. One 4-in. pipe and one 2-in. pipe were installed through the concrete. The 2-in. line was extended and connected with one of the needles and valves which previously had been drilled into the opening while attempting to plug it by other means (Figure 4).

Shortly before the concrete bulkhead had set sufficiently to withstand the pressure, the main mine pump sump, estimated to hold 20,000,000 gallons of water, filled and was overflowing into the lower levels of No. 2 Mine. (All pumps were running 24 hours daily—capacity 4,000 g.p.m.) Rather than flood the lower levels, it was decided to close the door at the bulkhead above referred to, located 1,200 ft. east of the heading face, until the concrete bulkhead had set.

It was estimated that the area cut by drifting and mining between this bulkhead and the drift heading would hold 18,000,000 gallons. It was reasonable to assume that if the main pump sump was empty, the water behind the closed bulkhead could be quickly released, and with the help of all pumps (4,000 g.p.m.) we could reach the newly set concrete bulkhead and close its valves before the main sump again overflowed to the lower levels. This program was followed.

Releasing the Water in the Drift

There were two 10-in. valves on the closed bulkhead and an estimated 30,000 g.p.m. was liberated through these valves while the pressure was high. The outflow decreased as the pressure went down. When the pressure dropped to 35 lb. p.s.i., the bulkhead door was opened slightly by the use of hydraulic jacks, which speeded up the emptying of the flooded area.

It required 20 hours to release the water so that men could enter the drift behind the bulkhead, at which time the main pump sump had filled and was again overflowing into the lower levels. The valves on the new concrete bulkhead were immediately closed.

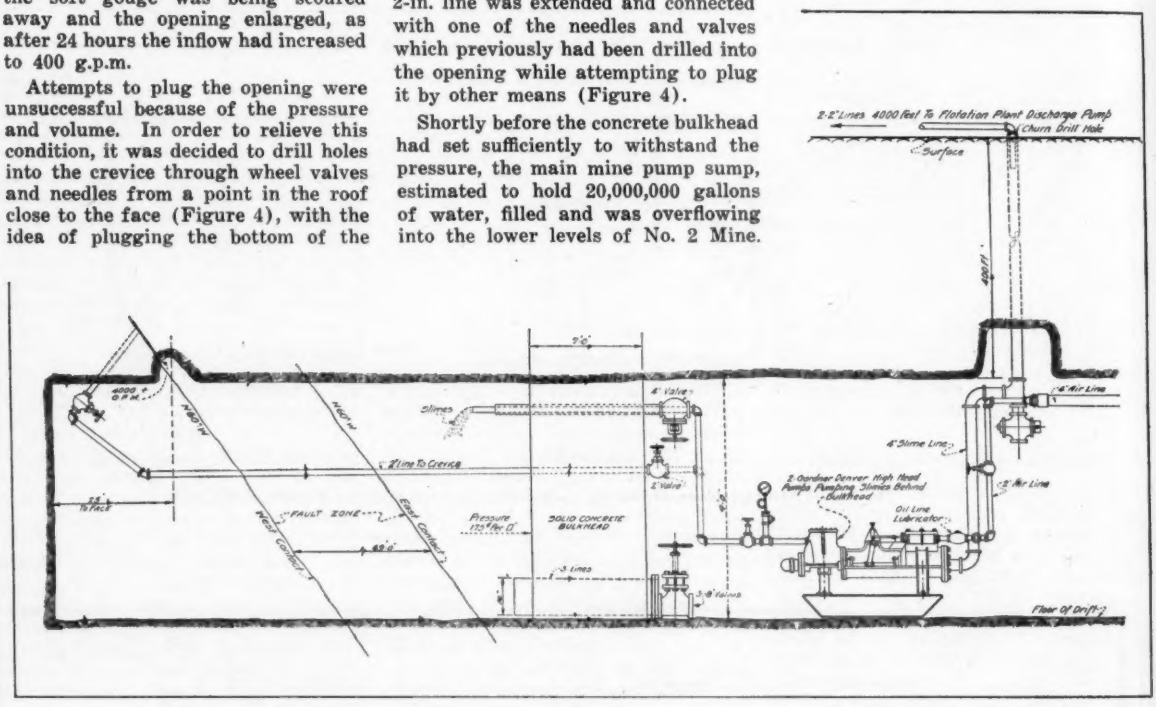

Fig. 4. Concrete bulkhead and high pressure pump arrangement for final sealing

Flotation Tailings Placed Beyond Bulkhead

The new solid bulkhead was about 100 ft. from the face of the drift. It was decided to fill the drift between the solid bulkhead and face with flotation tailings. A 6¼-in. diameter churn drill hole was drilled from the surface, 400 ft. in depth, intersecting the drift east from but near the solid concrete bulkhead. Flotation tailings were then pumped from the Flotation Plant a distance of 4,000 ft., and discharged

(*Continued on page* 36)

Recovering Mining Machinery From Squeezed Area

Careful Planning of Officials and Engineers Brings About Recovery of Approximately $50,000 Worth of Equipment Which Would Have Been Most Difficult to Replace

By C. M. DOVIDAS
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WARTIME CONDITIONS have precipitated many unusual problems in all phases of the lives of the people of the United States and the mining industry has confronted its full share of abnormal difficulties. One of the most perplexing of the problems of the coal-mining industry in its attempt to produce an increased tonnage during the war has been the lack of manpower, with a consequent increase of dependence on machinery and equipment not only to counteract the probable slump in tonnage due to lack of workers but even to raise the output beyond past performance. This threw a much heavier burden on all types of mining equipment and devices at a time when obtaining new equipment was almost out of the question and obtaining repair parts was at least equally difficult. Hence any occurrence which destroyed any equipment or tied it up so it could not be used was a vital blow to efforts to maintain or expand tonnage; this paper describes what one company did to recover some equipment taken out of use through a sudden occurrence beyond the power of the company to prevent.

A squeeze, accompanied by a cave, occurred between two faults in the 7 north section of the No. 2 mine, Dering Coal Company, Eldorado, Saline County, Illinois, about November 4, 1943, and large quantities of methane were liberated into the working sections. This caved area had to be sealed immediately, but most of the mining equipment in the affected area, which at first was presumed to be lost, was later recovered by driving entries in advance of the caved area and tapping into the abandoned entries. The mine had been idle for several days when the squeeze occurred, because the fan was being repaired, and no one was permitted to enter the mine while the fan was idle. The squeeze was discovered by the mine examiner when making his preshift examination of the mine after the fan had been repaired and put into operation.

Before formulating a plan of development to recover the mining equipment, which consisted of two loading machines, two shortwall mining machines, two drills, several thousand feet of steel rails, and other miscellaneous supplies, the company officials secured and studied all available information concerning this type of recovery work. The primary purpose of studying the different types of recovery procedures was to acquaint themselves with all possible hazards in connection with the venture and to use known safety measures to protect the lives of the workmen. The officials realized that many serious accidents have resulted from breaking into old workings or sealed areas, either by accident or intentionally, and especially if such areas contained methane, an explosive gas.

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Review of Mining Conditions

The mine is opened by two shafts that are about 460 ft. deep and 500 ft. apart and intersect the Illinois No. 5 coal bed, which averages 66 in. in thickness in this area. In all, 317 men are employed, and the average daily production is approximately 2,000 tons of coal. The mine is classed as gassy by the Bureau of Mines and has an estimated life of 14 years at the present rate of production.

The panel, room-and-pillar method of mining is followed, and approximately 50 percent of the coal is recovered. Where roof conditions permit, main entries are driven 18 ft. wide in sets of six. Cross entries are driven in sets of three or four at various intervals. Panel entries are driven in pairs at intervals of 620 ft. Rooms averaging 23 ft. in width and 300 ft. in depth are driven from both sides of panel entries. Room pillars are 22 ft. thick with crosscuts at intervals of 60 ft.

The roof conditions in this mine are such that extensive timber support is required.

The mine is ventilated by means of a steam-driven centrifugal fan, operated blowing, and delivering approximately 60,000 cu. ft. of air a minute.

The mine examiners use permissible flame safety lamps, and according to their reports, methane is found frequently, especially in the 7 north section where the squeeze occurred. Permissible electric cap lamps are used by all underground officials and employes, and smoking is prohibited in the mine.

The coal is undercut by nonpermissible shortwall mining machines, and shot holes are drilled by means of post-mounted, nonpermissible electric drills. Permissible explosives, fired electrically and stemmed with incombustible material, are used to blast coal at the end of the working shift. Cardox is used to blast a small amount of coal during the working shift in developing entries. All coal is loaded mechanically by means of nonpermissible mobile loading machines and pit-car conveyors. Haulage is accomplished by means of trolley and combination trolley and cable-reel locomotives. The main haulage roads and working entries are rock-dusted, but no rock dusting is done in rooms.

Recovery Procedure

The squeeze occurred in the 5 and 6 north entries off the 38 east entry in the 7 north section of the mine. The entries later caved tightly to the mouth of room 1, and since large quantities of methane were being liberated from the caved area into the working sections of the mine, the officials decided to seal the entries immediately. Four stopings, 2 ft. thick, were erected to seal the caved area. The seals were constructed of

concrete and concrete blocks and were well-hitched into the bottom, roof, and ribs. The entries were well-timbered before the seals were erected. A pipe with a valve was inserted in one of the seals to permit sampling the air and to relieve pressure from behind the seals. As an added precaution, a 6¼-in. churn-drill hole was later drilled from the surface into the sealed area to relieve the pressure from the territory behind the seals.

The calculations of the proposed plan of development, formulated by the officials of the company to recover the mining equipment, were checked and rechecked several times for accuracy by the company engineers before it was put into effect. This plan was put into operation December 19, 1943, with the intention of driving the 39, 40, and 41 east entries approximately 720 ft. and then driving a pair of south angle entries off the 39 east entry to tap into the abandoned 5 and 6 north entries off the 38 east entry. The angle entries were to be driven 310 ft., and the total distance to be driven was approximately 1,030 feet. This work was completed July 4, 1944.

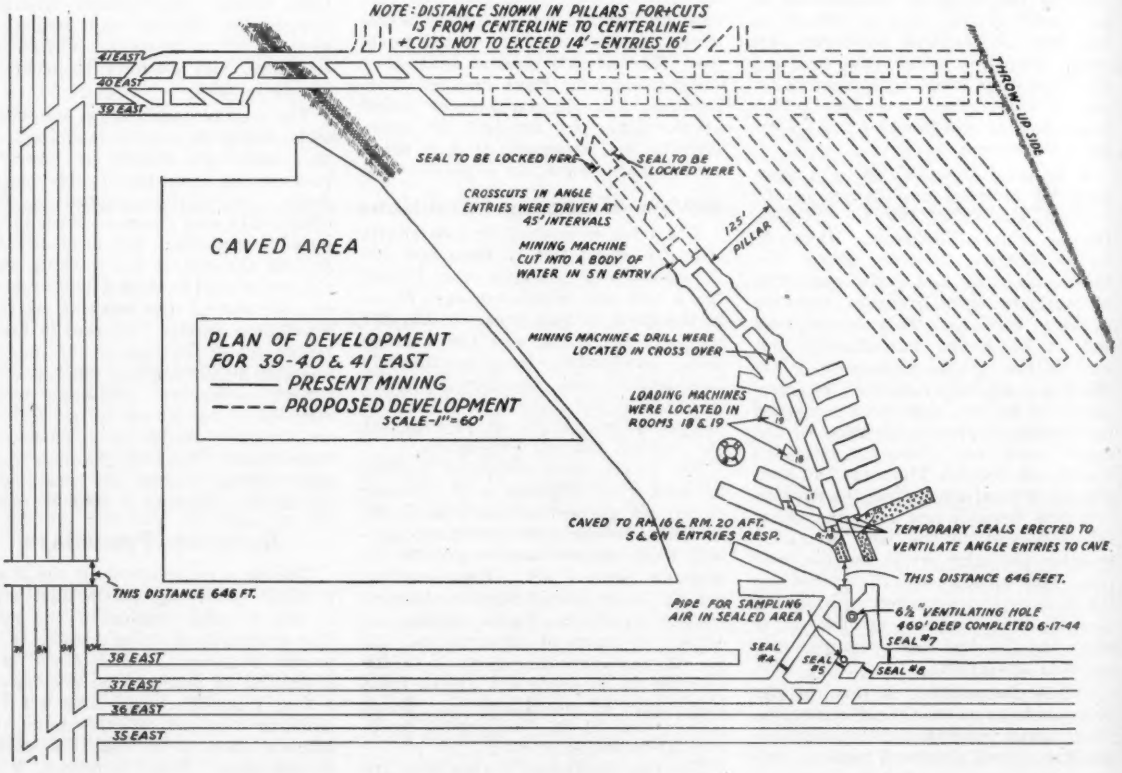
Fourteen men, divided equally on two shifts, followed the regular mining procedure to drive the entries. The coal was undercut by a nonpermissible shortwall mining machine having a 6-ft. cutter bar and drilled with a permissible electric drill borrowed from another mine in the vicinity. Cardox was used exclusively on both shifts to blast the coal. All wiring and haulage in the development entries were in intake air.

Precautions Upon Approach

Many precautions were taken in the mining procedure when a distance of 200 ft. was reached from the sealed area. A test hole was drilled 20 ft. in advance of the face of each entry, and 45-degree angle holes were drilled 20 ft. in depth in the corners of the face and ribs, as soon as each cut was loaded. A certified official equipped with a permissible flame safety lamp was in constant attendance, and when gas was detected, no electrical equipment was operated until the gas was removed. The development entries were rock-dusted thoroughly to within two cuts of the face, and all entries leading to the developing entries were rock-dusted thoroughly. Several bags of rock dust were kept near the face of each entry for emergency use. Crosscuts between the angle entries were driven at 45-ft. intervals, and a telephone was installed in intake air near the mouth of the entries.

On July 3, 1944, the test hole in the 5 north entry penetrated the sealed area. The intervening thickness of the coal, about 15 feet, was measured on the drill, and a mark was made on the rib to indicate the thickness of the pillar of coal to be penetrated. However, when the test hole was drilled into the sealed area, none of the electrical equipment was removed from the entries; the test hole was taking in air, and it later was plugged with moist rock dust. Two 5-ft. cuts were removed from each entry, and when the mining machine was undercutting the remaining 5 ft. of coal in the 5 N entry, water began to seep through the fire clay. The permissible electric drill was used to drill the final 4 holes, to within 18 in. of the distance needed to tap through to the sealed area. The only men allowed in the mine during the drilling of the last 4 holes were the drillers, the superintendent, and the mining engineer. The power was ordered cut off from the mine by the superintendent when the last hole was drilled, and as an added precaution to prevent sparking, the ringer cranks were taken off the telephones and an attendant, equipped with earphones, was stationed in the engine room so that the men on the inside could communicate with the men on the outside without ringing the telephone to attract attention.

An additional application of rock dust was applied in the working face


NOTE: DISTANCE SHOWN IN PILLARS FOR CUTS IS FROM CENTERLINE TO CENTERLINE — CUTS NOT TO EXCEED 18' — ENTRIES 16'
41 EAST
40 EAST
39 EAST
THROW-UP SIDE
SEAL TO BE LOCKED HERE
SEAL TO BE LOCKED HERE
CROSSCUTS IN ANGLE ENTRIES WERE DRIVEN AT 45' INTERVALS
125' PILLAR
CAVED AREA
MINING MACHINE CUT INTO A BODY OF WATER IN 5 N ENTRY
PLAN OF DEVELOPMENT FOR 39-40 & 41 EAST
PRESENT MINING
PROPOSED DEVELOPMENT
SCALE-1"=60'
MINING MACHINE & DRILL WERE LOCATED IN CROSS OVER
LOADING MACHINES WERE LOCATED IN ROOMS 18 & 19
CAVED TO RM. 16 & RM. 20 AFT. 5 & 6 N ENTRIES RESP.
TEMPORARY SEALS ERECTED TO VENTILATE ANGLE ENTRIES TO CAVE
THIS DISTANCE 646 FT.
THIS DISTANCE 646 FEET.
PIPE FOR SAMPLING AIR IN SEALED AREA
6¼" VENTILATING HOLE 469' DEEP COMPLETED 6-17-44
SEAL #4
SEAL #5
SEAL #7
SEAL #8
38 EAST
37 EAST
36 EAST
35 EAST

Calculations for the proposed plan of recovery were checked several times by company engineers before being put into effect

before the holes were charged with Cardox. The blasting cable was tested and found to be in good condition and was kept short-circuited until ready to attach to the trolley circuit, which was going to be used to fire the shots from outside of the mine. The sectionalizing switch, controlling power in this section of the mine, was opened and was checked before any electrical connections were made prior to blasting. All switches were closed as the men were leaving the mine. The holes were fired simultaneously from the outside, using the circuit breaker on the switchboard in the powerhouse.

Rescue Team on the Job

The services of the Eldorado mine rescue team were secured three hours before the holes were charged, in order that the sealed area could be explored after it was opened. After a waiting period of one hour, the workmen, mine officials, state mine inspector, and the Eldorado mine rescue team entered the mine in groups of three, at 200-ft. intervals. The state mine inspector, the mine superintendent, and the superintendent of the Eldorado mine rescue station constituted the first group to enter the mine, and they were equipped with a carbon monoxide detector, a methane detector, and a permissible flame safety lamp. The men made the 2½-mile trip to the sealed area very cautiously, and stopped to test for dangerous gases at frequent intervals.

The blast did not make an opening in the face of the 5 N entry. A small hole was finally made by the workmen after mining by hand through about 18 in. of coal. A canvas curtain was hung from the last breakthrough to the face of the entry. The sealed area was under negative pressure, and it was stated that the pressure was so great that large pieces of coal, when freed, were drawn into the sealed area. As the hole was made slightly larger, water, due to a swag in this part of the entry, was encountered and was bailed out by hand. While this was being done, the rescue team was sent out of the mine to wait until called. When the water was bailed out and the hole made large enough to travel through, positive pressure developed and the sealed area was given 12 hours to bleed.

Machines Located and Ventilation Established

On July 4, 1944, the fully equipped Eldorado mine rescue team made two 20-minute exploration trips into the sealed area, partly through water waist high, and located two loading machines, a drill, and a short-wall mining machine. The entries were found to be caved to room 16 off 5 north entry and room 20 off 6 north entry, approximately 500 ft. from the break-through in the 5 north entry. Very little gas was detected in using a permissible flame safety lamp on these exploration trips.

The remaining coal barrier in the 6 north entry was mined by hand to establish ventilation in the sealed area. When this was done, brattice-men, using copper tools and copper nails, erected temporary, plastered wooden stopings a few feet out by the cave in the abandoned entries and in a crosscut in room 16. When the ventilation was established, the services of the Eldorado mine rescue team were no longer required.

The water in the swags in 5 N entry, which was encountered by the rescue team on their exploration trips, was bailed out by hand, and the haulage road was connected preparatory to removing the mining equipment. The entries holed through exactly as figured by the mining engineers, and proved the accuracy of calculations in the plan of development.

Equipment Found in Good Condition

The equipment in the area affected by the cave was inspected and found to be in good condition. However, before this equipment was removed under its own power, a new cable was put on each machine so there would not be any possibility of having a cable blow out during the recovery procedures. Several of the officials, equipped with methane detectors and permissible flame safety lamps, maintained constant vigilance during the moving of the mining equipment to detect any accumulations of methane. No trouble was experienced while this recovery work was being done, and the steel rails and ties and other miscellaneous mining supplies were also recovered from this area. The estimated value of the recovered mining equipment, some of which probably could not be replaced for a long time, was approximately $50,000.

During the recovery procedure, preparations were made for the erection of permanent seals near the mouth of the angle entries. The work of removing the mining equipment and the erection of the permanent seals was completed July 8, 1944, approximately 8 months after the squeeze occurred.

The mine was shut down from the time the test hole penetrated the sealed area until the permanent seals in the angle entries were erected following the removal of the equipment.

Conclusion

The successful recovery of the mining equipment without loss of life or limb unquestionably was due to careful planning by the officials and mining engineers of the company, and the safeguards that were provided counteracted any hazards that might have been encountered.

Acknowledgments

The writer wishes to acknowledge the cooperation of the officials of the Dering Coal Company, through R. L. Lindsay, superintendent of the No. 2 mine, in furnishing the information used in this paper.

—Photo from the Bettmann Archive

Artist's impression of coal mining in the latter part of the 19th century, captioned "A group of engineers supervising operations, 1867"

The blasted rock is loaded by a 1¾-yd. Marion electric shovel into Euclid 15-ton crawler wagons hauled by International TD-18 tractors

Aerial Tramway at Vermont Asbestos Mines

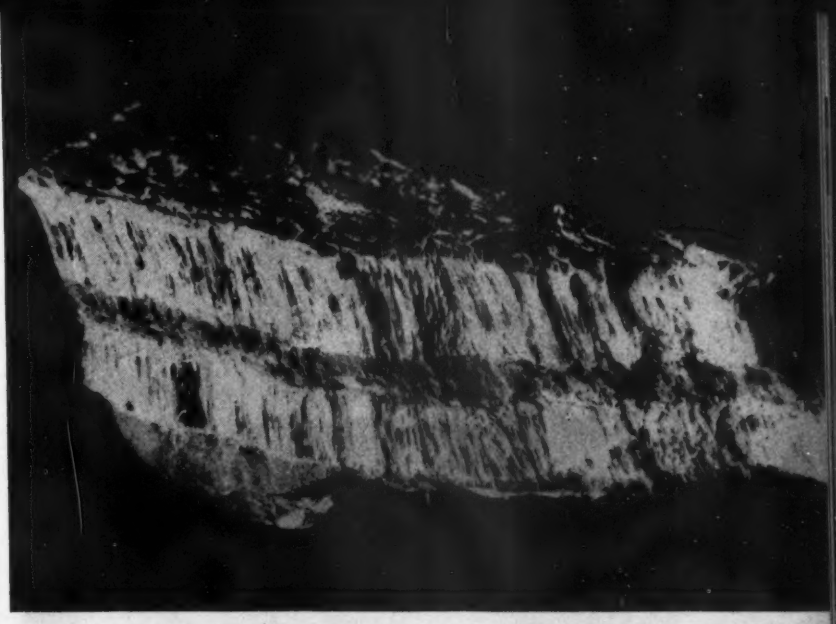
Aerial Tram Solves Problem of Year Round Ore Transport Over Rough Terrain

AN INTERESTING recent development in the field of asbestos mining in the United States was the construction by Vermont Asbestos Mines, Division of The Ruberoid Co., of a continuous-type aerial tramway, or cableway, designed to transport asbestos-bearing rock from a newly opened deposit at Lowell, Vt., to the company's extracting and processing mill at Eden, Vt.

The project is located on Mt. Belvidere in the northern section of the Green Mountains, the unloading terminal at Eden being a straight-line distance of about one mile from the Lowell mine and 1,000 ft. higher on the mountain. Operating at capacity the tramway can deliver 2,500 tons of asbestos ore a day.

The purpose of the tramway is to maintain a stockpile of asbestos ore sufficient to assure uninterrupted operation of the Eden mill, despite the severities of the Vermont winters which have previously necessitated shutdowns during several months. The problem was to determine the most economical means of accomplishing this. Construction of a direct road over the mountain was impractical because of the rugged nature of the terrain, and the distance over existing roads around the foot of the mountain was too great. Experience to date indicates that the tramway was the answer.

"Cross fiber" asbestos in the mother rock. Another form, "slip fiber," runs parallel to the rock fissure, and "mass fiber" is in irregular bundles or scattered through the rock →



Tramway Construction and Equipment

The ore is transported over the tramway in 42 flat-pan-type cars, each of one ton capacity. The cars ride on two parallel continuous track cables (19-strand, single wire) and are propelled by a 1-in. haul cable (6 x 16, steel center) to which they are attached at intervals of 240 ft. On the load side the track cables are 1¼-in., and on the return side ⅞-in. The tramway is driven through V-belts on one grip sheave by a 125-h.p. slip-ring motor, located at the discharge terminal. At the loading terminal is a G. E. control which, by releasing a spring brake, prevents any slide-back in case of a slowdown or stoppage. Each bucket ordinarily makes the round trip in 24 minutes.

The crushed rock passes over shaking screens to remove fine sand and bring the fiber to the surface, where it is sucked up into containers →

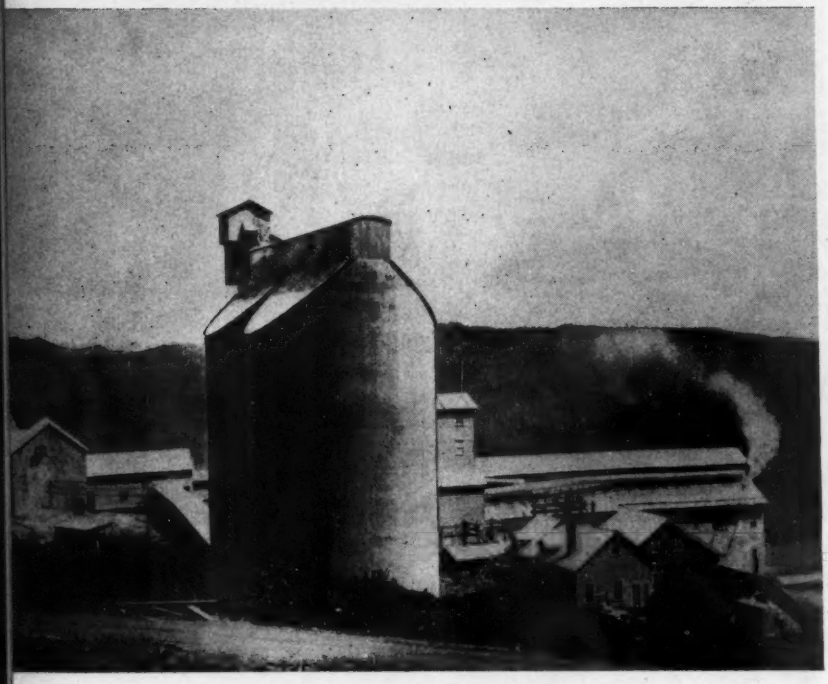
The tramway cables are supported by seven concrete-based steel towers with a maximum span of 1,500 ft. between high points. One of the towers is 100 ft. high, and the highest point from the cable lines to the ground below is 250 ft.

Operations at the Lowell Mine

At the Lowell mine, which is a quarry-like, open-pit operation, the primary drilling of blast holes is done with a Bucyrus-Armstrong T27 well drill with a 6⅝-in. bit. Shots averaging 30 holes, spaced from 15 to 17 ft. apart along the 80-ft. quarry face, bring down up to 75,000 tons of rock.

Secondary drilling is done with Ingersoll-Rand jackhammers supplied with air by an Ingersoll-Rand 350-c.f.m. compressor and two Sullivan 125-c.f.m. compressors. From 200 to 300 shots are detonated simultaneously by line current.

Asbestos fiber from the Ruberoid mill at Eden, Vt. →



Fiber processing mill at Eden. Two 5,000-ton concrete storage silos feed the belt conveyor which carries dry crushed ore to the plant

Looking up the mountain from the Lowell loading terminal toward the mill at Eden, about a mile away

The blasted rock is loaded by a Marion electric shovel of 1¾ cu. yd. capacity into Euclid 15-ton crawler wagons, which are hauled by International TD-18 tractors. After an average haul of about 200-ft., the ore is discharged into a chute at the edge of the quarry floor, leading to a Traylor 28 x 36-in. primary jaw crusher. In the course of two crushings—one in the primary crusher and another for over-size rock in a Symons 4¼-ft. standard-cone secondary crusher—the material is reduced to the desired size of 1½ in. or less.

Crushed Material is Taken to Eden

The crushed product is carried on a 24-in. by 500-ft. downhill belt conveyer to a 15,000-ton stockpile. From the stockpile it is withdrawn through a tunnel on a 24-in. by 400-ft. downhill belt-conveyor to a 50-ton bin at the tramway loading terminal. From this bin the empty tramway cars, as they arrive, are loaded automatically by means of a Jeffrey-Traylor vibrating feeder, and start their journey to Eden.

At the Eden terminal the ore is discharged into a 50-ton steel receiving bin, from which it is delivered by a disposal tramway to the main stockpile of about 150,000 tons capacity, located close to the plant. The single 4-ton bucket used on the disposal tramway is loaded automatically under the bin and makes its round trip, including loading and dumping, in about 2 minutes. The capacity of this disposal system is about 20 percent greater than that of the main tramway, thus permitting adequate flexibility of disposal.

Milling Operations

From the main stockpile the ore is carried by belt-conveyor to the plant, where it first passes through a large, oil-heated Hardinge rotary cylindrical dryer to remove excess moisture. The dry rock is then subjected to a third crushing to ½-in. size or less in a Symons 5-ft. S. H. crusher and carried by a belt-conveyor to two 5,000-ton concrete storage silos. Another belt-conveyor carries the ore, as needed, from the silos to the processing mill. A continuous check on the amount of ore production is kept by weightometers, which weigh the crushed material as it passes over conveyors.

Upon entering the mill, that portion of the asbestos fiber that has already become free of the matrix is removed by air separation. The first step in extracting the remaining fiber from the ore consists of running the dry rock through machines, known as "Jumbo" fiberizers, which largely separate the fiber from the rock. The rock and loosened fiber from these machines are then passed over shaking screens, which sift out the fine sand and bring the loosened fiber to the surface, where it is sucked up by air into collectors. The over-size material passing the suction hoods is passed on to a second series of fiberizers to insure maximum possible recovery of fiber. The final process is that of grading the fiber, the longest being the most valuable. The finished fiber, sacked in 100-lb. bags, is transported by a fleet of 4-ton International trucks 15 miles, largely over a state highway, to warehouses and shipping platforms at the railroad shipping point at Hyde Park, Vt.

Construction of the new aerial tramway, which has been widely acclaimed in the Vermont press as an important contribution to the state's industrial progress, was accomplished under the direction of C. T. Limerick, general superintendent of Ruberoid's Vermont operations, and his associates, working in close conjunction with engineers of the construction contractor, the Interstate Equipment Corporation, of Elizabeth, N. J.

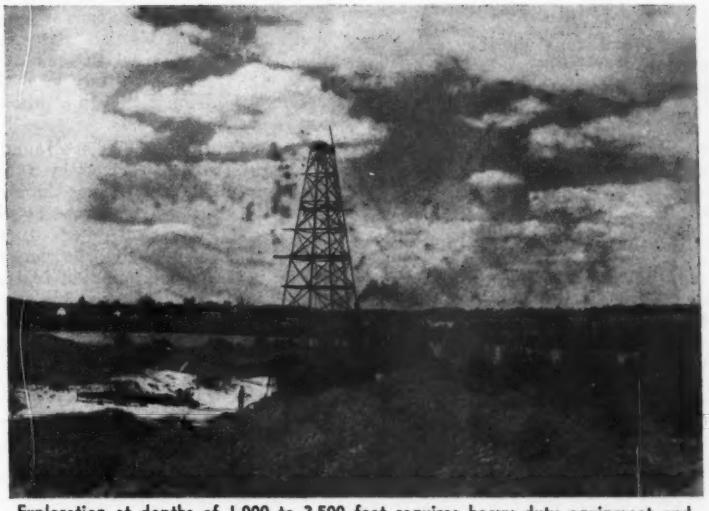
Asbestos fiber produced at the Vermont mines is of the chrysotile vaviety, and much of it is used by The Ruberoid Co. in the manufacture of asbestos-cement roofing and siding shingles, building boards and various insulating products. Since 1936, when the Vermont property was acquired by Ruberoid, shipments of asbestos fiber from the Eden mill have been increased more than 100 percent. Completion of the new aerial tramway not only makes possible year-round operation of the mill, thereby increasing production, but also makes available for milling the longer fibered asbestos from the Lowell deposit.

Geological Exploration On The Marquette Range

The Clearest Possible Understanding of Iron Formation Structures is Essential to Intelligent Exploration on This Famous Iron Range. Equipment is Selected With This in View and Interpretation of Data Proceeds Most Carefully

By BURTON H. BOYUM

Asst. Geologist
Cleveland Cliffs Iron Co.



Exploration at depths of 1,000 to 3,500 feet requires heavy duty equipment and tall derricks, which must be capable of transportation without too much difficulty

THE Marquette Range is the oldest of the Lake Superior ranges. It was discovered in 1844 by a Government survey party when they noted the deflection of their compass needles. Seeking an explanation of the anomaly, they found a surface exposure of iron ore. The news attracted prospectors who developed the surface exposures in Negaunee.

The district has produced every year since 1848. The first shipment of iron ore on Lake Superior consisted of six barrels of ore on July 7, 1852. At the present time it is the fourth largest iron ore producing district of the Lake Superior region and the fifth largest in the United States. The district has produced a total of 217,803,746 long tons of iron ore of all grades, including production from the Cascade Range but excluding the Gwinn District.

Several Grades of Ore Produced

The principal product has been soft red, brown, and purple earthy hematite and goethite ores, locally well compacted. Also important is the production of dense specular hematite and magnetite ores. Locally, the practice is to term them simply "soft ore" and "hard ore." For some time the district has mined a phase of the iron formation called "siliceous ore." This material, though not of high iron content, has the physical character and balance of constituents that makes it of economic value for metallurgical processes. All of the ores produced at the present time from the range are direct shipping ores. The only metallurgical operation practiced is crushing and screening at the mine. The district has produced some magniferous iron ore. A small amount of high sulfur ore is also produced. The following tabulation shows the average natural analyses of the three principal types of ore.

Constituent	Soft Ore	Hard Ore Lump	Hard Ore Siliceous
Iron	52.26	59.22	38.50
Phosphorus	0.089	0.105	0.033
Silica	7.68	9.44	41.20
Manganese	0.26	0.32	0.09
Alumina	2.44	1.98	0.88
Lime	0.64	0.87	0.20
Magnesia	0.35	0.63	0.22
Sulfur	0.011	0.012	0.009
Moisture	11.72	0.55	1.70

Geological Considerations

The ores are found in a series of Huronian sediments lying on a rock complex of Laurentian and Keewatin ages. The structure is that of a westward pitching synclinorium open at the west end. The eastern limit of the Huronian sediments is the shore of Lake Superior near the city of Marquette. The axis of the structure is almost east-west in strike and extends some 40 miles. The Huronian series consists of quartzites, slates, iron formations, dolomite, and pyroclastics. A considerable number of intrusives are found in the series. These intrusives are dikes, commonly occupying the faults; and sills or sheets, injected along the bedding. The sheets, constituting the bulk of the intrusives, are dioritic in composition. The dikes are either diabasic or andesitic. All are locally called greenstone.

All of the ore from the present productive mines is being extracted from the Negaunee Iron Formation. This formation is said to be Middle Huronian in age. It is underlain by the Siamo slate and overlain by the Goodrich slate and quartzite. The Negaunee Iron Formation has an average thickness of 2,000 ft. excluding the intrusive sheets. The maximum thickness is about 2,500 ft. The intrusive

sheets may have a maximum total thickness of 700 ft. At the present time certain of these intrusive sheets serve, locally, as horizon indicators (key beds) because they do not markedly transgress the bedding of the Negaunee Iron Formation.

The top 200 to 300 ft. of the Nagaunee formation is relatively much harder and is characterized by pink and red chert seams interbedded with specular hematite. This is known in the literature as Jaspilite. Locally, it is called Hard Ore Jasper. All through the formation there are residual unoxidized phases in the form of cherty iron carbonates, called Siderite.

Four Types of Ore Occurrence

There are four general types of occurrence of high grade iron ore on the Marquette Range.

First, there are the extensive deposits of "soft ore" lying on the footwall Siamo slate. Individual deposits may be up to 260 ft. in thickness and may have great lateral extent. The ore follows the structure and not the bedding. The ore to jasper contact often grades through lean ore though it may be abrupt. In some areas the iron content drops about 1 percent for each 5 ft. as the footwall is approached. Irregular chimneys or risers of ore often extend into the jasper capping or hanging wall. These chimneys make their development difficult. It is not uncommon for a development raise to extract the whole of the chimney.

Locally, in the Negaunee Iron Formation near the Siamo Slate footwall, an interbedded slate complex is found. It consists of one or more slate beds interstratified in the iron formation. These beds may be from a few feet to 125 ft. from the Siamo slate contact and may be up to 60 ft. in thickness. There may be ore both above and below this complex, as well as contained within it. The interbedded slate complex is frequently complicated by dikes. Both the slate and dike are fine grained in texture and often ferruginous to the point of being lean ore. The greatest problem in classification is to distinguish slate from dike. The most used method is to make a petrographic study of a thin section. Occasionally, even a thin section is not conclusive.

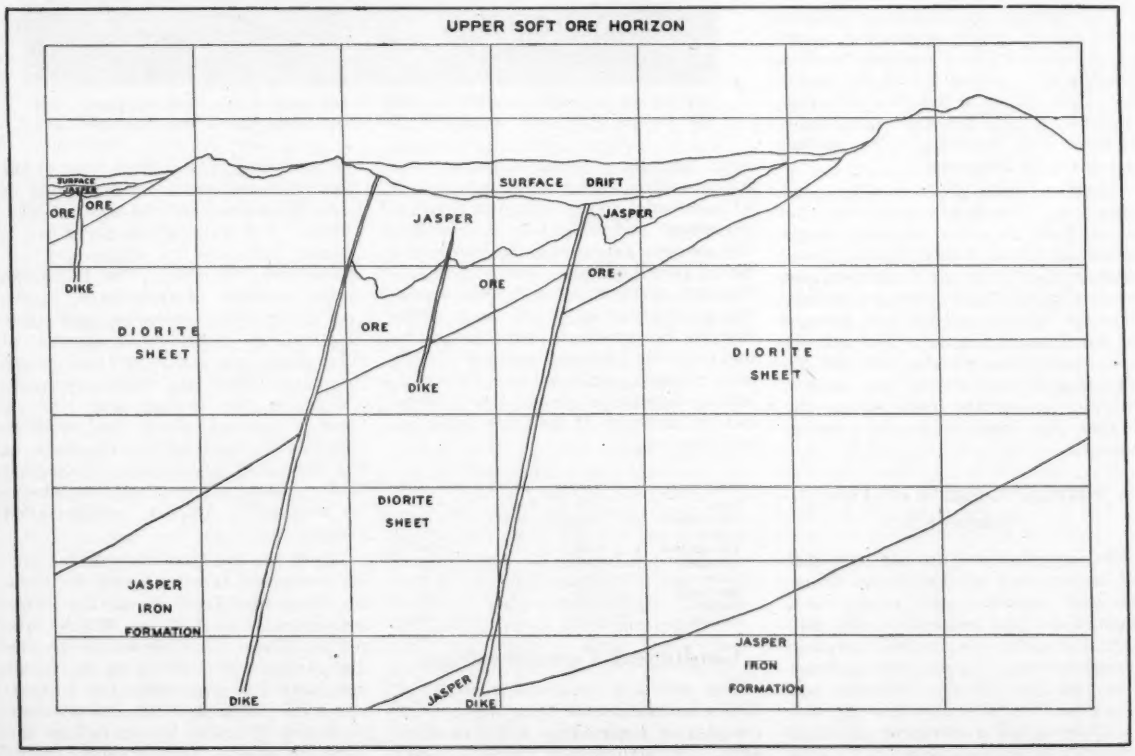
The footwall ore bodies are found in structural troughs formed by faults, folds, and dikes intersecting the slate. They are commonly traversed by vertical or nearly vertical dikes. In the eastern portion of the district the folding is the most prominent feature. This area is characterized by gentle dips. Also important are troughs formed by longitudinal faults in combination with the folding. As the central area is approached, the ore is found to lie in troughs formed principally by faulting. The known faults are both normal and reverse (tension and compression). The dip of the bedding becomes steeper on the flanks of the synclinorium to the west or open end of the main structure.

Soft Ores Lying on Intrusive Sheets

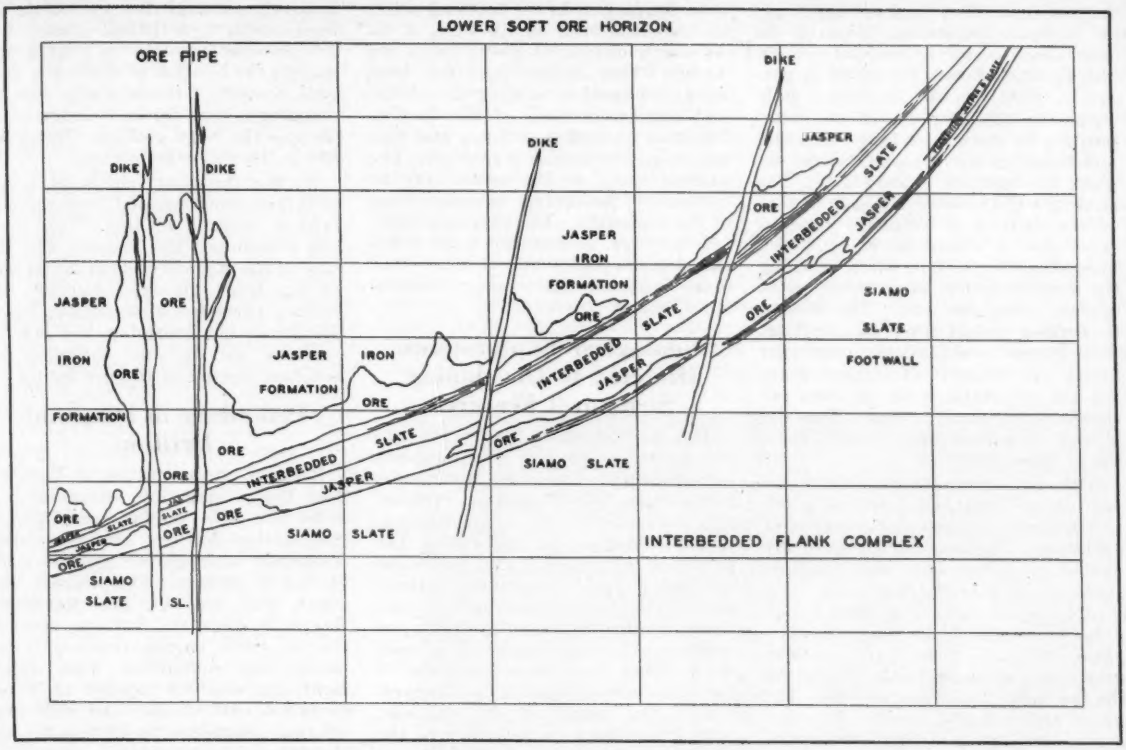
Second, many of the early "soft ore" mines in Ishpeming were in the horizon lying on the intrusive "greenstone" sheets in the Negaunee Iron Formation. This ore is of irregular occurrence both as to its distribution and thickness. The greatest ore bodies of this type occurred south of Ishpeming near the axis of the range synclinorium. There are no mines now operating in this type of ore occurrence. The soft ores lying on the sheets have the same relationship to the jasper capping as the footwall soft ores. The development of ore risers has been noted. The ores were of excellent grade in having high iron content, and low phosphorus and sulfur content.

"Hard Ores" in Upper Part of Negaunee Iron Formation

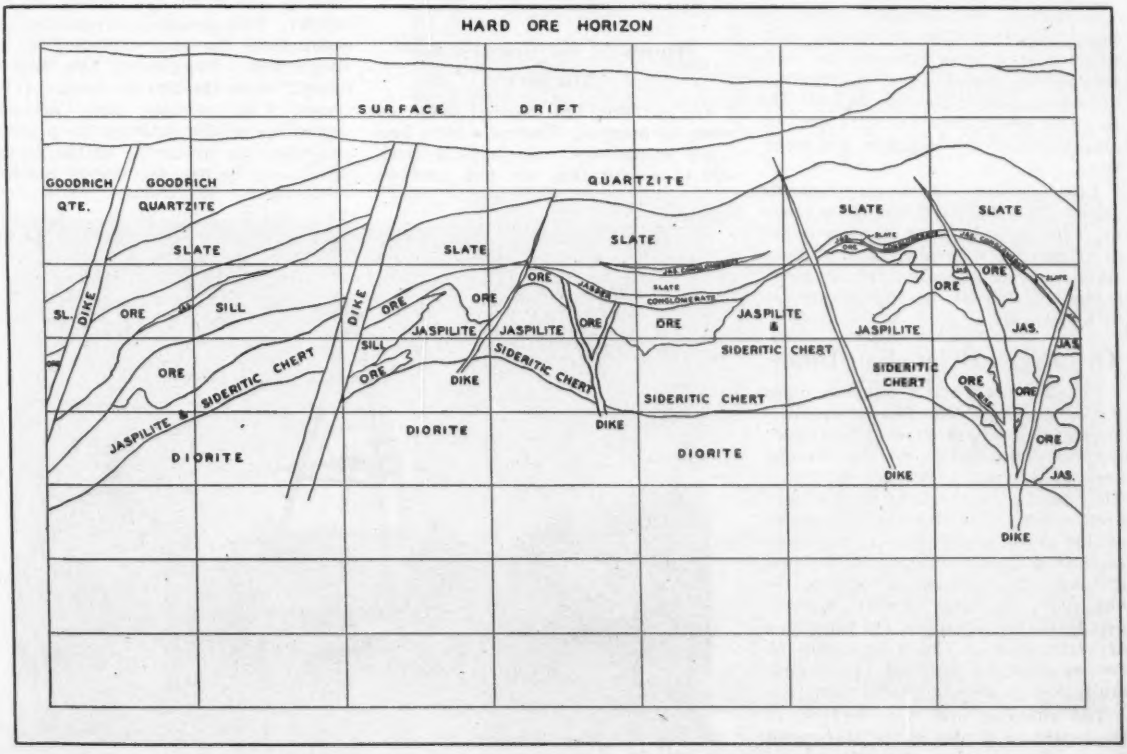
Third, the "hard ore" mines are found in the uppermost portion of the Negaunee Iron Formation. The



The soft ores lying on the intrusive sheets have the same relationship to the jasper capping as the footwall soft ores



Extensive deposits of soft ore lie on the footwall Siamo slate. A few ore pipes rise through the Negaunee formation; they are related to dike intersection systems



The principal hard ore deposits lie as a blanket under the Goodrich formation

largest deposits of hard ore are found in or near Ishpeming. Most of the hard ores occur immediately below the Goodrich formation which is generally slate at the contact. Only rarely is quartzite found in juxtaposition to the ore or iron formation and therefore development seldom exposes the quartzite underground. The structure of the hard ore area is that of the district, a westerly plunging syncline. A crossfold is developed under the town of Ishpeming bringing the iron formation-slate contact up to surface along the axis. The folding is further complicated by faulting. Both normal and multiple overthrust faults are known. Numerous dikes cut the structure, some of them occupying the fault zones. The ore horizon is underlain generally by a thick "greenstone" sheet.

Although the principal hard ore vein lies as a blanket under the Goodrich formation, there are a number of variations. These are droppers of ore extending down into the jaspilite, siderite, and onto the greenstone footwall. The ore may also have a jaspilite capping or it may lay upon jaspilite, sideritic chert, or intrusive greenstone as a footwall. Moreover the ore may grade laterally into jaspilite and sideritic chert. At least one occurrence is known where the hard ore, and the soft ore, lying on a greenstone sheet, are in immediate contact with one another.

The dikes which cut the hard ore area often are confused with the hanging wall slate. With the complicated structures present, one must be ever careful in the classification of these rocks. As noted with the footwall ore bodies, petrographic examinations of thin sections are necessary.

Locally there is a conglomerate series above the hard ore. This series may lie directly upon the hard ore or it may be separated from it by a slate member. Locally, the conglomerate is sufficiently extensive and rich to be mineable.

Ore Pipes Related to Dikes

Fourth, there are a few ore pipes rising through the Negaunee Iron Formation. These pipes are related to dike intersection systems having vertical or nearly vertical attitudes. They have a plan area of several hundred square ft. and a vertical extent of 400 ft. or more. Mining has been conducted satisfactorily in such pipes, although the ground is apt to be "heavy." The only known criteria explaining the origin of the pipe type of occurrence is the intersection of two or more dikes. Such ore is generally low in phosphorus content.

The siliceous ores are confined to the southeast border of the Marquette Range. The relations of the Negaunee Iron Formation to the footwall series on the south side, in this area, is not as clearly defined as elsewhere on the Range. This border zone has been metamorphosed more than the central and eastern portions of the district. The iron formation is dense and blue and locally resembles a jaspilite. The granite lying to the south may be responsible for contact metamorphism of the sediments. The resulting product, however, is uniform in its physical characteristics. As with the other ores, numerous dikes occur throughout the area.

Geological Explorations Directed to Developing Structural Features

The predominant feature of the Marquette Range iron ore deposits is replacement. Slumping of any magnitude is not known to exist. At present the origin of the ore concentration is subject to further study. The principal hypotheses are concerned first with ascending heated solutions, and second, with descending cold solutions. Both hypotheses postulate the addition of iron to the primary sediment rather than simple removal of the non-ferrous materials. Regardless of the nature of the solutions, more importance is attached to the structural features. Geological explorations are directed toward developing these structural features and, in turn to the possible ore bodies contained within them.

Modes of Exploration—Surface

On surface, the exposed ledge geology is mapped. Test pits have been used extensively. Geophysical methods of exploration are not used extensively although the dip needle has been useful to a limited extent. The proper interpretation of results may lead to the location of dikes and footwall contacts. Occasionally, vertical pipes have been driven to ledge to determine the ledge geology. This practice is termed standpiping.

By far the most important source of information obtained from the surface is diamond drilling. This practice determines the amount and nature of the surface overburden as well as the ledge geology. Further, the drilling furnishes a continuous log of the formation overlying the ore occurrence as well as obtaining an accurate sample of the ore bodies.

Procedure in Diamond Drilling

Because of the nature of the general Range structure, diamond drill holes are now major undertakings. Exploration for ore bodies is being conducted to depths of 1,000 to 3,500 ft. below surface. The deepest diamond drill hole on the Marquette Range is 3,523 ft. Surface exploration to these depths requires large, heavy duty equipment. This equipment also must be capable of transportation without too much difficulty. General practice is to drive a 4½ in. standpipe into the ledge. Some operators prefer to drill 30 to 50 ft. into the ledge with a 3-in. hole (NX size). The hole is then cased with BX casing and then drilled 2⅝ in. size (BX). This practice permits two size reductions in case difficulty is encountered. Frequently the hole is cased when the ore is reached. The cased hole permits more accurate sampling of the cuttings by preventing abrasion or caving of the formations cut, before the ore is reached.

Spruce tripods are used most commonly on shallow holes

At the present time we employ the rigid type double-tube core barrel for the greater part of our drilling. This core barrel obtains good core recovery in most ground. Of late, however, we have used a ball-bearing double tube core barrel while drilling ore. This barrel is an improved design, available only in the AX and BX sizes at present. Under proper supervision the use of this type of barrel will secure core where the rigid type double tube barrel will not. It is necessary to observe several precautions in the use of the ball bearing type barrel. The bottom of the hole should be as clean as possible before the drilling of each run begins. Crooked rods should not be used. If casing is used, it should be kept to within 10 ft. of the bottom. This barrel is most successful in vertical holes and extensive research has been conducted in its use by the Inter-State Iron Company. The core barrel is followed by one or two 10-ft. guide rods. These stiffer rods tend to promote smoother operation and reduce deviation of the hole.

Steam Drills Popular in Winter

Both steam and gasoline drills are used for surface drilling. Steam operated drills seem to be the more satisfactory for year-around operation in this climate. Our winters are rigorous and present several operating problems. Portable boilers provide steam power for operation of drill and pump, heat for drying samples and warming the shanty, and steam to blow out water lines. Steam rigs have been used successfully for drilling with both carbon and bortz set bits. At present the only gasoline operated drills are used by contract drilling organizations. The greater portion of surface and underground diamond drilling done on the Marquette Range is conducted by the iron mining companies' own organizations.

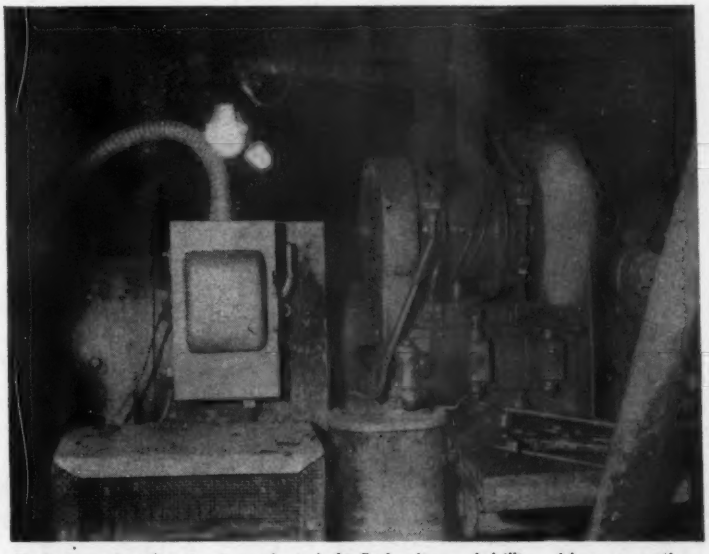
Both spruce tripods and steel "oil-well" type derricks are employed. Spruce tripods are used most commonly on shallow holes or holes drilled by gasoline powered rigs. These rigs are limited to pulling and disconnecting the drill rods in 30-ft. sections. The Cleveland-Cliffs Iron Company uses four of the steel derricks. It is possible to pull the rods in 50-ft. sections with these derricks. This operation was described in detail in the August 1944 MINING CONGRESS JOURNAL. Company practice is to use these steel derricks for holes of 1,500 ft. depth or greater.

Underground Exploration is Chiefly by Diamond Drill

Extensive exploration has been conducted underground. All companies have a practice of making detailed surveys of the mine workings. These are mapped for their geology. Generally, more detailed geological mapping is done on the main levels. Most mines have developed the practice of driving small drifts at a cost that is not excessive. These "dog" drifts, as they are called, have a cross-section of approximately 4 x 6 ft. They are excellent for defining the limits of an ore body as part of the development. Also they provide a good exposure for detailed mapping in critical areas.

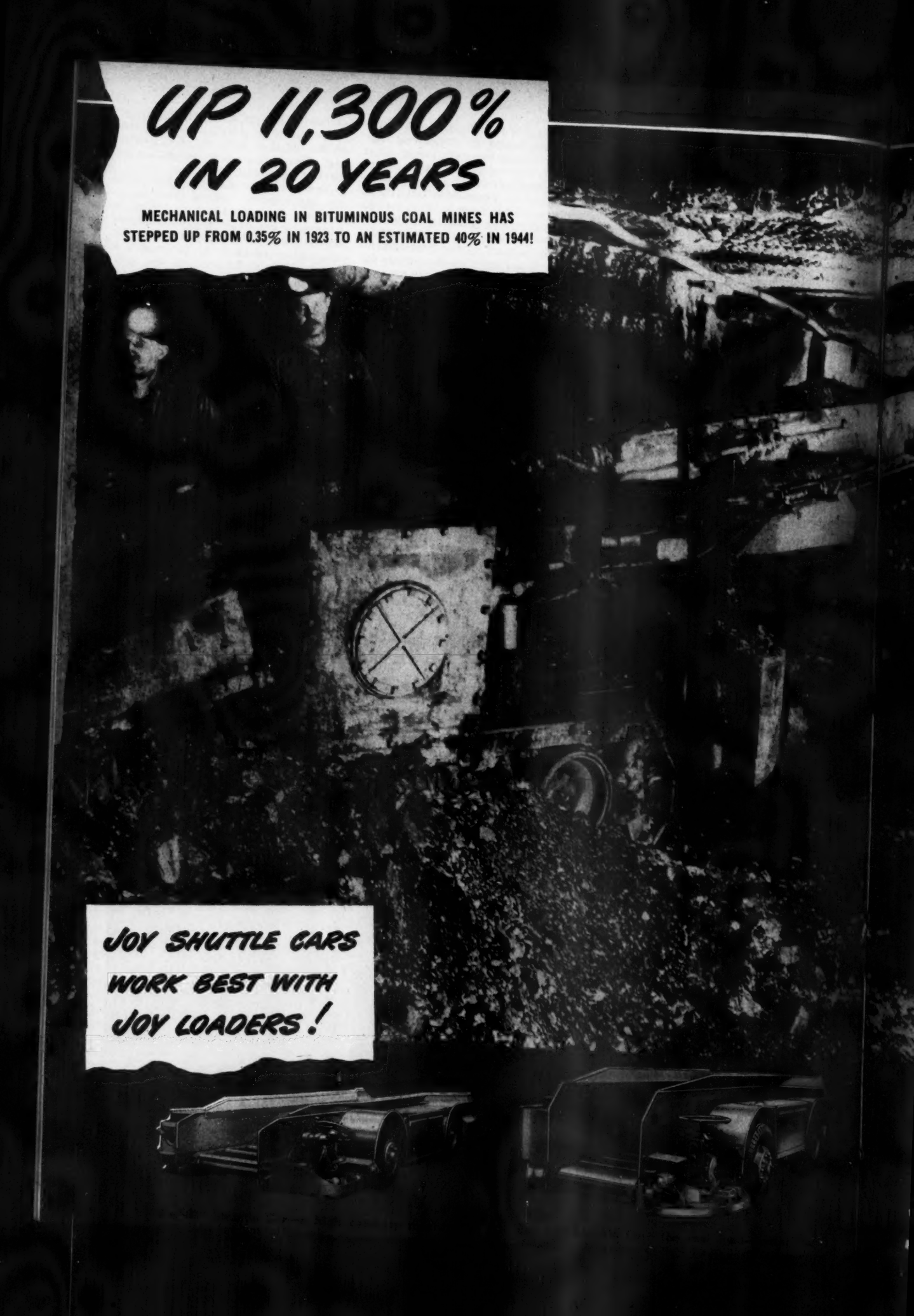
For the most part, underground exploration is conducted by diamond drilling. Many properties employ the year around services of at least one diamond drill. The drills vary in size from small one-man operated machines with a capacity of 250 ft. of EX drilling to large two men machines rated at 2,000 ft. of EX drilling. These drills are either air or electric powered.

The small one man operated drills are air powered. Since there is no hoisting drum on these machines, a pneumatic rod puller is often mounted on the column above the machine. An alternative method is to mount a small air hoist adjacent to the drill. General practice is to start the holes BX size. A 10 ft. section of AX casing then is installed and the balance of the hole drilled AX size. This permits one further size reduction. Often it is necessary to case the hole.



Underground exploration is conducted chiefly by diamond drilling. Many properties employ at least one drill the year round

The drills vary in size from one-men machines of 250 ft. EX capacity to two-men machines of 2,000 ft. EX capacity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The practice, in this instance, is to ream the casing ahead for every 10 ft. of advance. This is done by reaming with a standard AX bit mounted on a pilot or by reaming with a tapered reamer. This reamer was designed by the Geological Department of the Cleveland-Cliffs Iron Company.

Several factors determine whether air or electric operated machines shall be used for deeper holes. In some instances the air consumption of an air powered drill machine is such that neither it, nor the blast hole drill machines on the same air line can operate efficiently. Other instances of isolated operation are more adequately served by stringing an electric cable to the drill machine and pump, rather than laying the pipe line. We prefer the direct current motor to the alternating current, because of the greater flexibility in the control of power and speed. This is important, not only for drilling, but also for handling the drill rods.

Bits and Reaming Shells in Use

The advent of improved mechanically set bortz bits has altered the time honored practice of hand set carbon bits. The operators on the Range have experimented with many types and sizes of bortz. Investigations also have been made on matrix metal and the size and number of water grooves. Various styles of reaming shells have been used. Each company has standardized now on one or two makes of bits and reaming shells.

The advantages of bortz bits are lower in cost in homogeneous ground, greater core recovery, and less deviation developed in the hole. The disadvantages are poor performance in broken ground, frequent imperfections in bit manufacture resulting in broken bits, and the fact that bortz equipment is oversize gauge so that bortz cannot follow carbon equipment without reaming the hole. Admittedly, hand set bits require the service of trained personnel. The Cleveland-Cliffs Iron Company maintains a staff of three setters. Other operators prefer to use only bortz bits and suffer the loss while drilling broken ground.

General practice on the Range is to test the drill holes for deviation by using hydrofluoric acid to etch glass tubes and thus obtain the inclination. The course is determined by the Maas compass floating in gelatin. All holes deeper than 300 ft. are tested. The common testing interval is 200 ft.

Exploration on the Marquette Range has become a complex matter. Most of the ledge geology is known. Several interpretations of structure often are possible in the unexplored areas, based upon the ledge geology alone. Some geophysical method of determining ore occurrences or trends of concentration at depth would be valuable. To date, none has been developed. The remaining tools are diamond drilling and underground drifting. The latter is far more costly and apt to be done in the nature of speculation. Lastly there are the theoretical studies outlining ore bodies on the basis of the information obtained from the above mentioned methods, tempered in the light of our knowledge of developed ore bodies elsewhere on the Range.

Acknowledgment

The writer is greatly indebted to the following for valuable assistance in preparation of this paper: Edwin L. Derby, Jr., chief geologist, and Stanley W. Sundeen, superintendent, Cliffs Shaft Mine, Cleveland - Cliffs Iron Company. The managements of Cleveland-Cliffs Iron Company and the Interstate Iron Company were most generous in every way.

Water Problem Solved at Mascot

(*Continued from page* 22)

into the drill hole, to which we had anchored a 4-in. needle and valve at the point where the hole connected with the roof of the drift.

Two Gardner-Denver, high-pressure air operated pumps, whose suctions had been connected to the bottom of the drill hole, forced the tailings (against 175 lb. pressure) through the 4-in. line in the solid bulkhead and into the drift. When heavy flotation solids began to appear in the 2-in. pipe connected to the crevice, it was assumed that the drift had been completely filled with tailings and that they were being forced upward into the crevice. Pumping of tailings was discontinued and one of the pumps was connected to the 2-in. line for the purpose of pumping straight cement grout into the crevice. After pumping 440 bags of cement, the 2-in. line was flushed out with clear water and the grout allowed to set for 16 hours. A second grouting consumed 430 bags before the pump choked down.

Opening the Seal

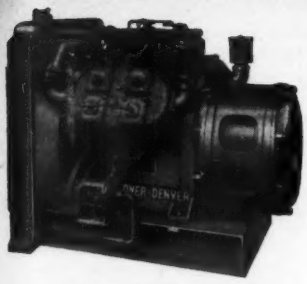
The grout was allowed to set for 72 hours before any of the five valves in the solid concrete bulkhead were opened. The 2-in. line was found to be completely sealed. The 4-in. line in the bulkhead, open on the pressure side, at first ran an appreciable volume of heavy tailings and water, but decreased to less than 50 g.p.m. after being open for 10 or 15 minutes. The lower three valves when opened allowed tailings to flow only when pressure was allowed to build up by closing the 4-in. valve.

The indications were that the crevice had been sealed and it was decided to drill out an opening through the solid concrete bulkhead, large enough for a man to pass through, for examining the conditions on the pressure side. The inspection was favorable, and immediately thereafter the removal of tailings from the pressure side was started. Approximately 75 per cent of these were pumped by a sand pump into an abandoned sump before it was decided to shoot out the remainder of the solid bulkhead. The remaining tailings were cleaned up with an Eimco-Finlay loader. Inspection, following the removal of all the tailings, indicated a complete and effective grouting job had been accomplished.

Concrete Ring Completes the Job

Fearing that the fault plane might give way at some other point along its westmost plane, a concrete ring was built around this portion of the drift. Drifting was again resumed the latter part of January, 1945. By the middle of May the drift had been advanced an additional 1,080 ft. into commercial ore, with very minor additional water difficulties. The formation ahead of the drift face was explored by diamond and hammer drill pilot holes, throughout its entire length.

This emblem signifies that the wearer is an honorably discharged veteran who has served our country in World War II



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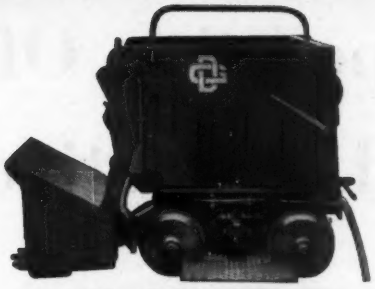

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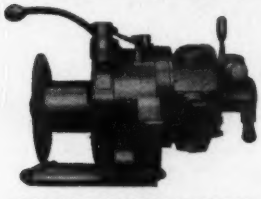

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By JOHN S. BELTZ
Chief Engineer, Mining Dept.
Jeffrey Mfg. Co.

IT IS not good practice to use a machine or material up to the absolute capacity limit and a failure of some part will usually occur when a piece of equipment operates for any length of time at its maximum rate. It is in recognition of this fundamental principle that a "factor of safety" is incorporated in structural and machine design and this term incidentally means just what it says —an insurance of efficient performance without damage to the equipment when the safe limit is not exceeded. For example, the fact that your auto is built to develop a top speed of 85 m.p.h. only assures that you can drive it without harm to the engine or running gear at a sustained speed of 65 or maybe 70 m.p.h.; if you force it for very long at an 85 mile rate, something will give way. However, there is no way for the automobile manufacturer to keep you from wearing out your car if you so desire. All the foregoing applies directly to our subject of operating and maintaining mine locomotives, and this article will attempt a brief discussion of what the operator and the manufacturer each can do to get the best results from the underground transportation system.

(Extract of address to West Virginia Chapter of AIEE, Beckley, W. Va., April 12, 1945.)

Requisites for Efficient Operation

In mine haulage we have three types of equipment—locomotive, rope and belts—and of these three, the locomotive is most subject to overloading and its consequent evils. A belt is more or less self protected; that is if overloading is attempted the coal will simply roll off and no harm done. In rope haulage, especially on a steep grade, the potential destructive results of a rope or hoist failure are so serious that safeguards are installed and correct operation is enforced so that misuse seldom occurs. A mine locomotive however has no such natural protection as the other two types and further, when overloaded will not stall or balk like a mule; it will either slip its wheels with excessive tire wear or else will burn out its armature. There is no preventive for both of these happen-

ings that can be incorporated in a locomotive design and the protection against damage and the insurance for an efficient performance lies mainly in its method of operation. Often, a reduction in the size of a too large trip will result in an increased shift production.

The things which affect the performance and the life of a locomotive are power supply, road bed, grades, speed, tons hauled, and mechanical maintenance. However, before discussing locomotive characteristics and methods of operation it should first be stated that two primary requisites for a haulage system are an adequate power supply and a good road bed. Without these no locomotive can properly function and there is nothing that can be built into a locomotive to overcome bad track and poor power. Methods of track construction with heavy rail, good alignment, and proper drainage are too well known to justify a discussion here and the same applies to the sizes for trolley wires, feeders and returns.

The track gradient is a most important factor in determining the tonnage that can be hauled in a locomotive trip and each one percent of raise adds 20 lbs. per ton of draw bar pull. The roadway grades are more or less fixed by the pitch of the seam although local dips can be overcome to some degree by taking top or bottom, but speaking generally, a five percent grade is usually considered as about the maximum for economical operation of main line locomotives. If this is exceeded for any great distances then it is time to think about some other type of equipment.

Power Used

The traveling speed has a major effect on the amount of electric power used for haulage. In order to increase tonnage from a mine it has frequently happened that a locomotive will be speeded up and this may work satisfactorily if there is adequate power on the lines. However, it must be remembered that the power consumed by a locomotive, pulling the same load, is directly proportional to its speed; therefore when the rate of a haulage unit is increased from five to 10 m.p.h., its h.p. is doubled and unless this fact has been anticipated trouble is apt to develop at the substation or in the transmission system. In speaking of anticipating the demand for mine power it may be worthwhile to cite one case where the operator planned to use two 20-ton locomotives; he found that his power supply, while adequate for two 20-ton locomotives if one was pulling a loaded trip and one an empty trip, was not sufficient when both were pulling loaded trips at the same time. Consequently he had to extend his haulage over two shifts instead of one. So you can't get something for nothing.

As manufacturers, we try to design our haulage locomotives with what we believe, from experience gained in actual mine operations, is the best balance between weight and power—that is, to get the greatest draw bar pull without slipping the wheels. However, sometimes we are asked to depart from our usual specifications; for instance some years ago we had a request from an operator for a locomotive especially designed so that the motors would not burn out. Accordingly, we built a locomotive of the lightest possible weight with the heaviest motor it was capable of standing; he put this in operation but entered a complaint in 60 days because a set of tires had been worn out in that time. Again, you can't get something for nothing.

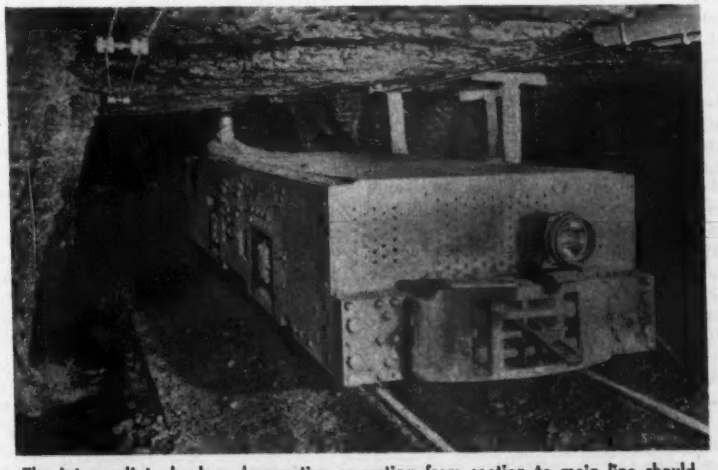
We find that the best rule is approximately 1½ h.p. per ton of locomotive weight per m.p.h. speed; that is multiply the weight of the locomotive in tons by its speed in m.p.h. and then multiply this figure by 1.5 to get the approximate total h.p. required. Assume a 20 ton locomotive running at 10 m.p.h. full load. $20 \times 10 \times 1.5 = 300$, so such a locomotive equipped with two 150 h.p. motors will do the job satisfactorily.

Anti-Friction Bearings

During the past 20 years continual improvements have been made in locomotive design and one interesting development has been the use of anti-friction bearings on the armatures and axles. Contrary to general belief, this was not done to decrease the

(*Continued on page* 64)

Service haulage at the face presents a number of special problems in locomotive maintenance



The intermediate haulage locomotive operating from section to main line should be selected with consideration for the abuses peculiar to this type of work

Service Haulage For Mobile Loading Machines

THIS IS A COAL DIVISION REPORT

A Survey Showing Mining Methods and Seam Conditions in Operations Using Mine Cars, Shuttles and Conveyors for Gathering

By the Committee on Mechanical Loading

AMONG the major post-war problems in coal mining will be that of raising the production of mechanical loaders closer to their rated capacities and, as is well recognized, one of the factors which now prevent a 100 percent loading performance is the service haulage—that is, the act of taking coal away from the machine at the working face. A number of different gathering methods have been developed with varying degrees of success for mine cars, shuttles and conveyors and the committee has undertaken a study to try and determine how each of these types of equipment may be used to the best advantage of the loading machine.

A first step in this study was to make a survey of service haulage methods now in use and reports from 27 companies in 7 states are given here in tabular form and in brief descriptions of each operation. In presenting this data, however, the committee wishes to emphasize that in their opinion the results of the survey are not conclusive and should not be used as a basis for making definite comparisons. Its main purpose was to discover whether or not any of these classes of haulage equipment seem to be the predominant choice for any given set of seam characteristics or operating conditions and in this respect it is very interesting to note that, in these reports, mine cars and shuttles are used under approximately similar conditions. A statistical analysis shows only slight differences in the seam heights, grades, bottom rolls, amount of pumping and rock handling in the mines operated by track as compared to rubber tires.

This, however, does not answer all questions we want to know and the next step in the committee procedure will be to make detailed studies of special phases of service haulage covering seam characteristics, mining systems, haulage efficiency and gathering costs. These reports are now under way and will be published as soon as they are completed.

Track Mounted Loaders With Mine Cars

Mine No. 1 operates track mounted loaders, each served by one 10-ton cable-reel locomotive and 9½-ton mine cars on 40-lb. rail; the roadways have a timbered clearance 6 ft. high by 10 ft. wide. Mining is by a modified block system with 14-ft. rooms and 85-ft. pillars that are recovered with mechanical loading. Cutting, drilling and shooting are done on the loading shift; partings and draw slate roof are shot down with the coal and cleaned at the surface plant. The maximum grade ordinarily does not exceed 5 percent; the floor is fire clay with frequent rolls and floor heaving sometimes occurs in the solid workings. Only 20 percent of the rooms have water and 10 percent are pumped. A standard panel has one mechanical loading unit and produces about 400 tons per shift.

Mine No. 2 operates track mounted loaders, each served by one 6-ton cable-reel locomotive and 3-ton mine cars on 30-lb. rail. The roadways have a timbered clearance of 6 ft. high by 12 ft. wide. Mining is by the room and pillar system with 28-ft. rooms and 12-ft. pillars that are not recovered. Cutting, drilling and shooting are done on the off-loading shift; a 10-in. parting and 2 in. of roof rock are gobbed underground. The grade averages about 1 percent in favor of the loads; the floor is fire clay without many rolls and floor heaving does not occur; the workings for the most part are dry and pumping is not needed. A standard panel has one mechanical loading unit and produces about 500 tons.

Mine No. 3 operates track mounted loaders, each served by two 6-ton cable-reel locomotives and 3½-ton mine cars on 35-lb. rail; the roadways have a timbered clearance 7 ft. high by 10 ft. wide. Mining is by the room and pillar system with 25-ft. rooms and 20-ft. pillars that are not recovered. Cutting, drilling and shooting are done on the off-loading shift; partings are not removed underground and the coal is cleaned at the surface plant. The seam is practically level; the floor is fire clay with no rolls and only occasional bottom heaving; the workings are usually dry and pumping is not needed. A standard panel has one mechanical loading unit and produces about 745 tons per shift.

Mine No. 4 operates track mounted loaders, each served by one 8-ton cable-reel locomotive and 6-ton mine cars on 40-lb. rail; the roadways have a timbered clearance 9 ft. high by 10 ft. wide. Mining is by the room and pillar system with 25-ft. rooms and 75-ft. pillars that are recovered with mechanical loading. Cutting, drilling and shooting are on the off-loading shift and no slate picking is done underground. The maximum grade is 8 percent against the loads; the floor is fire clay but no rolls are present and bottom heaving does not occur. Some water is encountered and pumping is needed in the dips. A standard panel has one mechanical loading unit and produces an average of 403 tons per shift.

Mine No. 5 operates track mounted loaders, each served by one 8-ton cable-reel locomotive and 6-ton mine cars on 40-lb. rail; roadways have a timbered clearance 6 ft. high. Mining is by the room and pillar system with 25-ft. rooms and 15-ft. pillars that are not recovered. Cutting, drilling and shooting are done on the off-loading shift and 4 in. of roof rock is gobbed underground. The maximum grade against the loads is 5 percent. The floor is coal; a few bottom rolls are encountered but floor heaving does not occur. The workings are dry and

REPRINTED AUGUST, 1945
MINING CONGRESS JOURNAL
MUNSEY BUILDING WASHINGTON 4, D. C.

DATA ON SERVICE HAULAGE METHODS WITH MOBILE MECHANICAL LOADERS

Mine No.	Mechanical Loaders in Panel	Service Haulage Equipment Used with One Loader	Panel Production per Shift	Mining System	Seam Partings	Roof Rock	Roadway Timbered Clearance	Water and Pumping in Panel	Max. Grade Bottom Rolls
LOADERS WITH MINE CARS									
1	1 Track Loader	Mine Cars—9.5 tons One 10-ton locomotive	400 tons	Block System Pillars	Cleaned on Surface	Slate shot and loaded	6′ high 10′ wide	Pump 10% of places	10% grade Many rolls
2	1 Track Loader	Mine Cars—3 tons One 6-ton locomotive	500 tons	Rooms No Pillars	10″ slate Gobbed	2″ slate Gobbed	6′ high 12′ wide	Dry No pumping	1% grade Few rolls
3	1 Track Loader	Mine Cars—3.5 tons Two 6-ton locomotives	745 tons	Rooms No Pillars	Cleaned on Surface	None	7′ high 10′ wide	Dry No pumping	Level No rolls
4	1 Track Loader	Mine Cars—6 tons One 8-ton locomotive	403 tons	Rooms and Pillars	None	None	9′ high 10′ wide	Pumping in dips	8% grade No rolls
5	1 Track Loader	Mine Cars—6 tons One 8-ton locomotive	600 tons	Rooms No Pillars	None	4″ slate Gobbed	6′ high	Dry No pumping	5% grade Some rolls
6	2 Track Loaders	Mine Cars—3 tons One 8-ton locomotive	520 tons	Block System Pillars	None	None	6′ high 9′ wide	Places wet Pumping	3% grade Some rolls
7	2 Track Loaders	Mine Cars—5 tons One 8-ton locomotive	600 tons	Block System Pillars	None	None	6′ high 10′ wide	Places wet Pumping	3% grade Some rolls
8	2 Track Loaders	Mine Cars—4.5 ton One 8-ton locomotive	600 tons	Block System Pillars	None	None	6′ high 10′ wide	Some wet No pumping	2% grade Some rolls
9	2 Tractor Loaders	Mine Cars—198 cu. ft. One 8-ton locomotive	192 tons	Rooms and Pillars	Gobbed	Gobbed	5′-6″ high 10′ wide	No pumping	Level No rolls
10	1 Tractor Loader	Mine Cars—3 tons One locomotive	200 tons	Rooms and Pillars	2″ to 6″ Loaded		4′ high	Places wet Some pumps	Some 18% Many rolls
11	1 Tractor Loader	Mine Cars—198 cu. ft. One locomotive	109 tons	Rooms and Pillars		18″ slate Gobbed	6′-6″ high	Usually dry No pumping	1% grade No rolls
12	3 Tractor Loaders	Mine Cars—3 tons One 6-ton locomotive	460 tons	Rooms and Pillars	None	None	3′-6″ high 10′ wide	Some wet Pumping	Easy grade Some rolls
13	1 Tractor Loader	Mine Cars—150 cu. ft. One 5-ton locomotive	125 tons	Rooms and Pillars	None	None	4′ high 11′ wide	Places wet Pumping	8% grade Some rolls
14	1 Tractor Loader	Mine Cars—210 cu. ft. One 8-ton locomotive	176 tons	Rooms and Pillars	None	6″ to 24″ Gobbed	5′-6″ high 12′ wide	Places wet Pumping	8% grade Some rolls
15	1 Tractor Loader	Mine Cars—100 cu. ft. One 6-ton locomotive	125 tons	Rooms and Pillars	None	None	5′ high 11′ wide	Dry No pumping	10% grade Few rolls
LOADERS WITH SHUTTLE CARS									
21	2 Tractor Loaders	Two Shuttles—3 tons Battery or Cable	350 tons	Mod. Block Pillars	6″ to 10″ Loaded	2″ to 4″ Loaded	4′-5′ high 14′ wide	Mostly dry Few pumps	5% grade No rolls
22	2 Tractor Loaders	Shuttles—128 cu. ft. Storage Battery	154 tons	Rooms and Pillars	7″ parting Loaded out	Up to 6′ Loaded out	4′-6′ high 10′ wide	Some wet 20% pumped	½% grade Few rolls
23	2 Tractor Loaders	Shuttles—3 tons Storage Battery	400 tons	Rooms No Pillars	9″ parting Gobbed	None	5′-5″ high	Some wet Pumping	Level No rolls
24	1 Tractor Loader	Shuttles—3 tons Storage Battery	150 tons	Rooms No Pillars	None	6″ slate Gobbed	46″ high 14′ wide	Dry No pumping	1% grade Some rolls
25	1 Tractor Loader	Shuttles—5 tons Storage Battery	300 tons	Rooms and Pillars			7′ high 13′ wide	Places wet Pumping	1% grade No rolls
26	3 Tractor Loaders	Shuttles—2.25 tons Cable Reel	800 tons	Rooms and Pillars		3″ to 5″ Loaded out	3′-9″ high 12′ wide	Dry No pumping	3% grade Few rolls
27	1 Tractor Loader	Shuttles—6 tons Cable Reel	210 tons	Rooms and Pillars	8″ slate Loaded out	None	5′-6″ high 10′ wide	Places wet Pumping	2% grade No rolls
28	1 Tractor Loader	Shuttles—6 tons Cable Reel	220 tons	Rooms No Pillars	20″ to 26″ Gobbed	None	7′-6″ high 10′ wide	Dry No pumping	10% grade No rolls
07	1 Tractor Loader	Shuttles—5 tons Storage Battery	350 tons	Block System Pillars	None	None	5′-8″ high 11′ wide	Dry No pumping	1% grade No rolls
LOADERS WITH ROOM CONVEYORS									
31	2 Tractor Loaders	Chain Conveyor to Entry Belt	250 tons	Rooms No Pillars	None	None	42″ high	Dry No pumping	1% grade No rolls
32	1 Tractor Loader	Chain Conveyor to Mine Cars	115 tons	Rooms No Pillars	None	None	40″ high 12′ wide	Some wet Pumping	3% grade No rolls
33	2 Tractor Loaders	Chain Conveyor to Entry Belt	200 tons	Rooms No Pillars	6″ parting Gobbed	Slate Gobbed	42″ high 12′ wide	Some wet Pumping	10% grade Rolls

no pumping is needed. A standard panel has one mechanical loading unit and produces from 500 to 600 tons per shift.

Mine No. 6 operates track mounted loaders, each served by one 8-ton cable-reel locomotive and 3-ton mine cars on 45-lb. rail; the roadways have a timbered clearance 6 ft. high by 9 ft. wide. Mining is by the block system with 11½-ft. rooms and 65-ft. pillars that are recovered with mechanical loading. Cutting, drilling and shooting are done on the loading shift and any partings or slate encountered are loaded out and removed at the surface plant. The maximum grade is 3 percent; the floor is fire clay with some bottom rolls but floor heaving does not occur. The workings are rather wet and pumping is needed. A standard panel has two mechanical loading units and produces an average of 520 tons per shift.

Mine No. 7 operates track mounted loaders, each served by one 8-ton cable-reel locomotive and 5-ton mine cars on 40-lb. rail; the roadways have a timbered clearance 6 ft. high by 10 ft. wide. Mining is by the block system with 12-ft. rooms and 103-ft. pillars that are recovered with mechanical loading. Cutting, drilling and shooting are done on the loading shift and partings or any roof rock that may come down are loaded with the coal and separated at the surface plant. The maximum grade is 3 percent; the floor is slate with fairly frequent bottom rolls and some floor heaving occurs. The places are usually wet and pumping is needed. A standard panel has two mechanical loaders producing about 600 tons per shift.

Mine No. 8 operates track mounted loaders, each served by one 8-ton cable-reel locomotive and 4½-ton mine cars on 40-lb. rail; the roadways have a timbered clearance 6 ft. high by 10 ft. wide. Mining is by the block system with 12-ft. rooms and 100-ft. pillars that are recovered with mechanical loading. Cutting, drilling and shooting are done on the loading shift and any seam partings are loaded with the coal and cleaned on the surface. The maximum grade is 2 percent; the floor is slate with frequent bottom rolls but heaving does not occur. Water is encountered throughout the workings but no pumping is needed at the faces. A standard panel has two mechanical loaders which produce about 600 tons per shift.

Tractor Loaders With Mine Cars

Mine No. 9 operates tractor loaders, each served by one 8-ton locomotive and mine cars of 198 cu. ft. capacity on 40-lb. rail; the roadways have a timbered clearance 5½ ft. high and 10 ft. wide. Mining is by the room and pillar system with 23-ft. rooms and 3-ft. pillars that are recovered with mechanical loading. Cutting, drilling and shooting are done on the loading shift; a 7-in. parting and draw slate of 1 ft. or more of thickness are gobbed underground. The seam is approximately level with bottom coal left for the floor; no rolls or heaving occurs and the working places are dry. A standard panel has two mechanical loading units and produce an average of 192 tons per shift.

Mine No. 10 operates tractor loaders, each served by one cable-reel locomotive with 3-ton mine cars on 30-lb. rail; the roadways have a timbered clearance 4 ft. high. Mining is by the room and pillar system with 20-ft. rooms and 30-ft. pillars that are recovered with mechanical loading. Cutting, drilling and shooting are done on the loading shift; partings from 2 to 6 in. thick are loaded with the coal and cleaned on the surface. The floor is clay and slate; the grades vary from level to 18 percent; bottom rolls are present; floor heaving frequently occurs, and considerable pumping is needed in the working places. A standard panel has one mechanical loading unit and produces about 200 tons per shift.

Mine No. 11 operates tractor loaders, each served by one cable-reel locomotive and mine cars of 198 cu. ft. capacity on 40-lb. rail; the roadways have a timbered clearance 6½ ft. high and 7 ft. wide. Mining is by the room and pillar system with 23-ft. rooms and 23-ft. pillars that are recovered with mechanical loading. Cutting, drilling and shooting are done on the loading shift; some draw slate comes down which is partially gobbed and partially loaded out. The floor is limestone; the seam is approximately level without bottom rolls or floor heaving and no pumping is needed. A standard panel has one mechanical loading uint and produces an average of 109 tons per shift.

Mine No. 12 operates tractor loaders, each served by one 6-ton cable-reel locomotive and 3-ton mine cars on 30-lb. rail; the roadways have a timbered clearance 46 in. high and 10 ft. wide. Mining is by the room and pillar system with 20-ft. rooms and 45-ft. pillars that are recovered with mechanical loading. Cutting, drilling and shooting are done on the loading shift and there are no partings or roof rock to handle. The seam is nearly level, having only minor local grades; the floor is fire clay with frequent bottom rolls and some floor heaving. Water is encountered and at times pumping is needed at the working faces. A standard panel has 3 mechanical loading units and produces about 460 tons per shift.

Mine No. 13 operates tractor loaders, each served by one 5-ton cable-reel locomotive and mine cars of 150 cu. ft. capacity on 25-lb. rail; the roadways have a timbered clearance 48 in. high and 11 ft. wide. Mining is by a modified block system with 15-ft. rooms and 35-ft. pillars that are recovered with mechanical loading. Cutting, drilling and shooting are done on the loading shift but there are no partings or roof slate to handle. The maximum grade reaches as high as 8 percent; bottom rolls are present but no floor heaving occurs. Water is encountered and some pumping is needed at the working faces. A standard panel has one mechanical loading unit and produces an average of 125 tons per shift.

Mine No. 14 operates tractor loaders, each served by one 8-ton cable-reel locomotive and mine cars of 210 cu. ft. capacity on 25-lb. rail; the roadways have a timbered clearance 5½ ft. high and 11 ft. wide. Mining is by the room and pillar system with 12-ft. rooms and 35-ft. pillars that are recovered with mechanical loading. Cutting, drilling and shooting are done on the loading shift; no partings are present but a draw slate of from 6 to 24 in. is taken down and gobbed inside. The maximum grade is 8 percent; the floor is fire clay and some bottom rolls are present but heaving does not occur. Most of the working places are wet and pumping is needed. A standard panel has one mechanical loading unit and produces about 175 tons per shift.

Mine No. 15 operates tractor loaders, each served by one 6-ton cable-reel locomotive and mine cars of 100 cu. ft. capacity on 25-lb. rail; roadways have a timbered clearance 5 ft. high and 11 ft. wide. Mining is done by a modified block system with 15-ft. rooms and 35-ft. pillars that are recovered with mechanical loading. Cutting, drilling and shooting are done on the loading shift but there are no partings or roof rock to handle. The maximum grade is as high as 10 percent; the floor is clay; bottom rolls are occasionally present and floor heaving occurs to some extent. The workings are dry and no pumping is needed. A standard panel has one mechanical loading unit and produces 125 tons per shift.

Loaders With Shuttle Cars

Mine No. 21 operates tractor loaders and shuttle cars; these have a capacity of 3 tons, are operated with storage batteries (some with cables) and dump onto a belt conveyor in the entry. Mining is by the modified block system with 16-ft. rooms and 80-ft. pillars that are recovered with mechanical loading. The roadways have a timbered clearance of from 4 to 5 ft. high. Cutting, drilling and shooting are done on the loading shift; a 6- to 10-in. parting and occasionally

from 2 to 4 in. of roof slate is loaded with the coal and all impurities are separated at the surface plant. The maximum grade is 5 percent; bottom coal is left for the floor and no rolls or heaving ocurs. Pumping is needed in only a few places. A standard panel has either one or two mechanical loading units, each producing approximately 175 tons per shift.

Mine No. 22 operates tractor loaders and shuttle cars; these have a capacity of 128 cu. ft., are operated by storage batteries and load into mine cars on the entries. Mining is by the room and pillar system with rooms varying from 14 ft. to 28 ft. and pillars of these same dimensions are mined with mechanical loading. Cutting, drilling and shooting are done on the loading shift; a 7½-in. parting and roof slate sometimes as thick as 6 ft. are loaded out. The grades are level; the floor is coal with very few bottom rolls and no heaving. Pumping is required in about 20 percent of the working places. A standard panel has two mechanical loading units producing 154 tons of coal, together with the roof slate that comes down.

Mine No. 23 operates tractor loaders and shuttle cars; these have a capacity of 3 tons, are operated by storage batteries and haul from the face to mine cars on the entry. Mining is by the room and pillar system with 26-ft. rooms and 14-ft. pillars that are not recovered; the roadways have a height of 5½ ft. Cutting, drilling and shooting are done on the loading shift and a 9-in. parting in the seam is gobbed underground. The floor is fire clay and is approximately level with no bottom rolls and only occasional floor heaving. Some of the working places have water where pumping is needed. A standard panel has two mechanical loading units producing about 400 tons per shift.

Mine No. 24 operates tractor loaders and shuttle cars; these are 3-ton capacity operated with storage batteries and dump onto a gathering belt in the entry. Mining is by the room and pillar system with 28-ft. rooms and 15-ft. pillars that are not recovered; the roadways have a timbered clearance of 46 in. high and 14 ft. wide. Cutting, drilling and shooting are done on the loading shift; the seam has no partings but 6 in. of roof slate comes down and is gobbed underground. The bottom is fire clay, approximately level with some bottom rolls and floor heaving, and the places are dry so that no pumping is needed. A standard panel has one mechanical loading unit and produces about 150 tons per shift.

Mine No. 25 operates tractor loaders and shuttle cars; these are 5-ton capacity operated by storage batteries and discharge into an elevating conveyor which loads the mine cars on the entry. Mining is by the room and pillar system with 14-ft. rooms and 18-ft. pillars that are recovered with mechanical loading. The roadways have a timbered clearance 7 ft. high and 13-ft. wide. Cutting, drilling and shooting are done on the loading shift and there are no partings or slate to handle. The seam is approximately level; the floor is slate with no bottom rolls or heaving but some of the places are wet and pumping is occasionally needed. A standard panel has one mechanical loading unit and produces 300 tons per shift.

Mine No. 26 operates tractor loaders with shuttle cars; these are 2¼-ton capacity operated by a trailing cable and haul from the face to mine cars on the entry. Mining is by the room and pillar system with 20-ft. rooms and 50-ft. pillars that are recovered by mechanical loading; the roadways have a timbered clearance of 45 in. high by 12 ft. wide. Cutting, drilling and shooting are done on the loading shift and 3- to 5-in. rash parting at the top of the seam is loaded out. The maximum grade is 3 percent; the floor is slate with occasional bottom rolls and floor heaving is only encountered in the pillar work. The places are dry and no pumping is needed. A standard panel has 3 mechanical loading units producing about 800 tons per shift.

Mine No. 27 operates tractor loaders and shuttle cars; these are 6-ton capacity operated by a trailing cable and having an elevating discharge boom for loading into mine cars on the entry. Mining is by the room and pillar system with 20-ft. rooms and 40-ft. pillars that are recovered with mechanical loading. The roadways have a timbered clearance 5½ ft. high by 19 ft. wide. Cutting, drilling and shooting are done on the loading shift; the seam has a parting of from 8 to 10 in. which is separated at the face and loaded out. The seam has only a slight grade, the floor is hard clay and bottom rolls or heaving do not occur. Water is encountered and some pumping is needed. A standard panel has one mechanical loading unit and produces about 210 tons per shift.

Mine No. 28 operates tractor loaders and shuttle cars; these have a capacity of 6 tons, are operated by a trailing cable and have an elevating discharge boom for loading into mine cars on the entry. Mining is by the room and pillar system driving 26-ft. rooms but not mining the pillars mechanically. The roadways have a timbered clearance 7½ ft. high by 10 ft. wide. Cutting, drilling and shooting are done on the loading shift and partings in the seam are separately operated at the face and gobbed underground. The maximum grade is from 8 to 10 percent; the floor is hard clay but no rolls or heaving occurs and pumping is not needed. A standard panel has one mechanical loading unit.

Mine No. 29 operates tractor loaders and shuttle cars; these have a capacity of 5 tons, are operated by storage batteries and load into mine cars on the entry. Mining is by the block system with 18-ft. rooms and 72-ft. pillars that are recovered with mechanical loading. Cutting, drilling and shooting are done on the loading shift; coal is left for top and bottom and no slate handling is required. The seam is approximately level with no bottom rolls but floor heaving sometimes occurs. The places are dry and no pumping is needed. A standard panel has one mechanical loading unit.

Loaders With Room Conveyors

Mine No. 31 operates tractor loaders discharging into room conveyors which take the coal to a gathering belt in the entry. Mining is by the room and pillar system with rooms 300 ft. long, 28 ft. wide and a 12-ft. pillar that is not recovered; the roadways have a timbered clearance 42 in. high but a variable width, depending on roof conditions. Cutting, drilling and shooting are done on the loading shift but there are no partings or roof rock to handle. The seam is approximately level; the floor is fire clay without bottom rolls but some heaving does occur. The places are dry with no pumping needed. A standard panel has two mechanical loaders.

Mine No. 32 operates tractor loaders discharging into room conveyors which convey to mine cars on the entry. Mining is by the room and pillar system with rooms 300 ft. long, 30 ft. wide, leaving 10-ft. pillars that are not recovered; roadways have a timbered clearance 40 in. high and 12 ft. wide. Cutting, drilling and shooting are done on the loading shift; the seam has no partings and no top brushing is done in the rooms. The maximum grade is 3 percent; the floor is fire clay but neither bottom rolls nor floor heaving occur. Some of the working places have water and need pumping. A standard panel has one mechanical loader.

Mine No. 33 operates tractor loaders discharging onto a room conveyor which takes the coal to a gathering belt in the entry. Mining is done by the room and pillar system with rooms 300 ft. long and 30 ft. wide, leaving 15-ft. pillars that are not recovered; roadways have a height 42 in. and a timbered clearance 12 ft. wide between the posts. Cutting, drilling and shooting are done on the loading shift and a parting 6 in. to 8 in. thick is gobbed inside. The maximum grade is 10 percent; the floor is fire clay and bottom rolls and heaving both occur. Some of the places are wet and pumping at times is needed. A standard panel has two mechanical loaders.

Interrupting Capacity of Circuit Breakers

By L. W. SCOTT
Engineer
General Electric Co.
Charleston, W. Va.

The Increased Use of Electrical Power in Coal Mines Has Brought About Major Changes in Power Supply Systems. Danger Exists Where Proper Interrupting Capacity of Circuit Breakers is Not Taken Into Account

WHY is the interrupting capacity rating of circuit breakers a matter of vital importance to the user and especially to the coal mine operator? Because if this rating is exceeded there is danger that the breaker may fail and cause a fire which may spread to other apparatus or even to the mine itself.

The AIEE standards define rated interrupting current of a circuit breaker as the highest root mean square current, at a specified operating voltage that the breaker shall be required to interrupt under the operating duty specified and with a normal frequency recovery voltage equal to the specified voltage. The rated Kva. interrupting capacity of a circuit breaker is the product of the rated interrupting current of the breaker, the rated voltage and the phase factor. This latter is 1.73 for three phase, 2 for two phase and 1 for single phase.

The standard operating duty of a circuit breaker other than the non-oil tight type consists of two closing-opening (CO) unit operations with a 15-second interval between operations. The Kva which the breaker may be required to interrupt is the sum of the power which may be delivered through the breaker into the short circuit from the source plus the power which may be fed through the breaker into the short circuit from any synchronous machines on the circuit feeding the breaker. In figuring the generator contribution to the short circuit current the Kva capacity and subtransient reactance are used, while for synchronous motors transient reactance is used.

Power Consumption in Coal Mining Has Increased

Some years ago when many of the oil circuit breakers for coal mines and the smaller industrial plants were first installed, the central stations from which they were purchasing power were of small capacity and most of the transformer banks supplying these users were of low capacity. In fact, in the majority of these small plants and in practically all of the mines in the early days, almost any circuit breaker of sufficiently high continuous current carrying capacity,

From address to West Virginia Chapter of A.I.E.E., and New River & Winding Gulf E. & M. I., Beckley, W. Va., April 12, 1945.

and having a voltage rating equal to or higher than that of the system on which it was to be used, was satisfactory from an interrupting capacity standpoint.

This is no longer true. Today in place of individual power houses of relatively small size, the stations supplying the industry of this district are very large. Some of them have capacities of over 300,000 kw. and are among the largest in the country, and, in addition, several of these large power plants are connected to the same system so that huge amounts of power can feed into a short circuit on these systems. Furthermore, with the increased production of industries and mines and the great amount of mechanization, larger and larger transformer banks have been required to supply these users.

Three huge cables convey power to the working face in this chamber at Maple Hill colliery of Philadelphia & Reading Coal Co.

Capacity Rating Explained by Example

If the voltage is maintained on the high voltage side of these transformers during a short circuit on the low voltage side, the short circuit Kva on the low voltage side is the rating of the transformer bank divided by the impedence of the transformers, expressed as a decimal. For example, if the impedence of the transformers is 5 percent and the capacity of the bank is considered as unity, then 1 divided by .05 equals 20; that is, the short circuit Kva, which an 8-cycle power circuit breaker must interrupt, will be 20 times the capacity of the transformer bank.

The central stations supplying this territory today are, in many cases, capable of sustaining full voltage or very nearly so at the high voltage terminals of industrial and mine substations with a short circuit on the low voltage side. There are large numbers of circuit breakers in use today which have interrupting ratings of only 15,000 Kva. Assuming transformers of 5 percent impedence, a bank of three 250 Kva units would have a short circuit capacity on the low voltage side of 15,000 Kva and a bank of three 300 Kva units would have a short circuit capacity of 18,000 Kva provided voltage were maintained at normal at the high voltage terminals during the short circuit.

Coal Mine Operators Should Ascertain Ratings of All Their Circuit Breakers

It may be of interest to note that there are 60 transformer banks consisting of three 300 Kva units or larger on the Appalachian Electric Power Company's lines feeding coal companies in the Charleston Division.

Any user being supplied from a transformer bank of a total rating of 900 Kva or larger should ascertain the interrupting rating of all of the oil circuit breakers in use on his system on the low voltage side of these banks. If any of these breakers have an interrupting rating less than the capacity of the Kva rating of the transformer bank divided by the impedence of the bank expressed as a decimal, he should then determine from the power company the short circuit Kva at the location of his circuit breakers. If this value exceeds the interrupting rating of the circuit breaker then corrective steps must be taken.

Maximum equipment performance and protection is best attained through installation of proper circuit breakers

Suppose the Rating of the Breaker Is Exceeded?

What should be done if the interrupting rating of the breaker is exceeded? Either a breaker of larger interrupting rating must be installed or a current limiting reactor connected so as to limit the short circuit current to the required value.

Great care should be taken in considering the installation of a current limiting reactor as it may result in instability and pulling out of step of motor generator sets and in pulling out of step combined with poor d-c voltage regulation on synchronous converters. By far the simplest, cheapest and most satisfactory remedy is to replace inadequate breakers with modern breakers of ample interrupting capacity in modern structures.

We must place maximum emphasis on the fact that serious results and damage may result from a severe short circuit which exceeds the interrupting rating of the breaker.

A hard-headed gorilla may not mind being hit by one coconut. But repeat it several hundred times and he'll never be the same.

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WHEELS OF GOVERNMENT

As Viewed by A. W. DICKINSON of the American Mining Congress

RUNNING ahead of schedule by approving the United Nations Charter July 28 by a vote of 89 to 2, the Senate is now headed for its summer recess, the House having previously departed July 21 under an agreement to reconvene on October 8.

The staff of the Joint Committee on Internal Revenue Taxation will continue its labors through the summer and early fall, in preparation for hearings which Finance Committee Chairman Walter George states will begin late in October on the entire fiscal program, covering individual and corporation taxes, social security, and unemployment compensation. Taking present revenues of $43 billion and estimating the budget for the first year after the end of the war with Japan at from $22 to $25 billion, Senator George indicates an accompanying tax reduction of from $18 to $21 billion, although he warns that it is difficult to estimates taxes "until we learn what the people can bear in the postwar period."

Tax Adjustment Act

Senate approval and House concurrence in Senate amendments was given July 19 to the Tax Adjustment Act of 1945, designed to strengthen the cash position of business enterprises during the reconversion period. Stricken were the railroad relief provisions originally placed in the bill by the House Committee on Ways and Means, which would have extended carry-back coverage to railroad companies under receivership and reorganization. Unavailing were efforts to apply retroactively the $25,000 specific exemption from excess profits tax to January 1, 1945, as well as the attempt to write in a repeal of the excess profits tax at the end of the first year following termination of hostilities with Japan. These last two issues were pressed by Representative A. Willis Robertson of Virginia.

Intangible Drilling Costs

Although finally approved by a Senate vote of 51 to 16 on July 21, House Concurrent Resolution 50, carrying Congressional approval of Treasury regulations which grant oil and gas taxpayers an option to deduct certain drilling and development costs as current expense, was made the center of a spirited Senate floor controversy. Senator Abe Murdock of Utah maintained that Congress should write appropriate language into the law, and assailed what he termed resort to a Concurrent Resolution "in order to set the Congress up as an appellate court for the purpose of interpreting the laws of the country, and in so doing condemning the decisions of a Federal court." Murdock offered an amendment to the Tax Adjustment Act of 1945 to accomplish the purpose of H. Con. Res. 50, and only withdrew it following the assertion of Finance Committee Chairman Walter George that his action would delay passage of the relief measure.

When H. Con. Res. 50 was being considered by the Senate, Murdock was joined by Senators White of Maine, LaFollette of Wisconsin, Ferguson of Michigan, Taft of Ohio and Donnell of Missouri in charging that its approval would establish a questionable precedent. Senator Murdock offered a substitute resolution to the effect that the substance of the Treasury regulations correctly expresses the will and intent of Congress "and should be enacted as part of our tax laws at the earliest possible date." Senate approval of H. Con. Res. 50 was accomplished only after prolonged debate and the final withdrawal of Murdock's substitute.

Bretton Woods

A Senate vote of 61 to 16 on July 19, followed quickly by House concurrence in three Senate amendments, placed the Bretton Woods bill before President Truman for approval. The first two Senate amendments placed restrictions against the use of funds from the World Bank on Monetary Fund for armament purposes, and set forth a statement of U. S. policy respecting a conference between participating nations on the removal of trade barriers. The third amendment struck out section 6 of the Bretton Woods bill reading "when the United States is requested by the Fund to communicate the par value of the United States' dollar, such par value shall not be communicated as other than 15-5/21 grains of gold nine-tenths fine." Under existing statutes the United States' dollar is defined in terms of both gold and silver.

Oklahoma Senator Elmer Thomas' amendments to create a $35 coin to be known as the "gold ounce" and to direct payment of the American subscription to the Bank in silver as well as in gold were not included in the bill, the first being rejected and the second withdrawn by Thomas following a statement on the floor by Utah's Senator Abe Murdock that the Secretary of the Treasury proposes to issue silver certificates against 300 million ounces of silver now available in the Treasury.

Throughout the legislative course of the bill in the Senate Committee on Banking and Currency and on the Senate floor, chief opposition to the

Washington Highlights

CONGRESS: Recessed to October 8.
SENATE: Ratifies United Nations Charter.
TAXES: "Tax Adjustment Act of 1945" becomes law.
DRILLING COSTS: H. Con. Res. 50 approved.
BRETTON WOODS: Monetary Fund provisions modified.
GOLD MINES: Capital equipment priorities still limited.
WAGE CLAIMS: Gwynne bill hearings go over till fall.
COAL PRICES: OPA to allow increases in some districts.
MINE MANPOWER: Army refuses to release soldier-miners.

measure was offered by Senator Taft of Ohio, who insisted that the Monetary Fund will not only fail to accomplish the declared objectives but will really "amount to nothing more than international loans of $2,750,000,000 for which we shall get nothing in return." Failing in his attempt to accomplish postponement of action on the bill until November 15, Taft made a final try with an amendment which would have denied any nation access to the Monetary Fund if it retained trading restrictions on its own currency. Majority Leader Barkley of Kentucky sprang quickly to the support of the Bretton Woods proposal by telling the Senate that the Taft amendment, if adopted, would have the effect of killing the entire Agreement.

Additional foreign lending facilities were made available to the Administration through Congressional approval of the Export-Import Bank expansion bill, which makes that agency permanent, expands its lending facilities to $3.5 billion, and repeals the Johnson Act prohibiting private loans to European governments in default of their World War I obligations.

Gold Mining

WPB's lifting of the gold mine closing order, L-208, on June 30, while making gold mines "non-serialized mines" under order P-56, has not been followed by the granting of priorities assistance on purchases of capital equipment items above $500 in cost. While Canada now permits its gold mines to purchase new machinery and equipment, the same limitations prevail on making such purchases in the United States.

The hiring of men for work in gold mines is a matter which has to be worked out by each mining company with its War Manpower Commission regional office. Likewise, if the question of paying a higher rate than that in effect at the time of the shutdown arises the problem has to be worked out with the regional representatives of the War Labor Board.

Limit Wage Claims

Now recessed until October, the hearings on the Gwynne bill, which would provide a limitation of two years for public suits and one year for private suits under Federal laws including the Wage Hour Act, are expected to be resumed with consideration of a rewritten form of this measure embodying some of the suggestions brought out by testimony. L. Metcalfe Walling, Wage and Hour Administrator, has suggested a three-year limitation on the bringing of back-pay suits and has objected to the recognition by Federal law of State statutes of limitations providing shorter periods. Walling asked authority to bring action directly in the recovery of wages due under the Act, and to promulgate regulations defining and interpreting the Act so as to protect an employer from criminal or civil liability when he follows the Administrator's interpretation. He also recommended provision for the simple restoration of wages owed, without liquidated damages, where the violation is not wilful or when the violator has followed the Administrator's interpretation, when that interpretation is not sustained by the courts.

Meanwhile a Federal district court in California has held that the Alaska Juneau Gold Mining Company did not violate the overtime-compensation requirements of the Fair Labor Standards Act when it changed from a weekly payment plan to a "split-day" plan. The decision cited that in the spring of 1939 counsel for the Alaska Juneau company, together with other mining men and 14 representatives in Congress, were told by the Wage-Hour Administrator that hourly rates of pay could be reduced so that, when added to the overtime rate of pay (time and one-half) it would result in the employes receiving the same or slightly more wages than they were previously paid. Following this the Alaska Juneau company and its miners made an agreement providing for a daily rate of pay at seven hours regular time and one hour overtime. Later they were notified that this plan was a violation of the Act and under a stipulated judgment paid a large sum of money to cover overtime payments to employes from December, 1940, to April, 1941.

In the case decided by the court, employes sought liquidated damages for the period covered by the judgment and also overtime and liquidated damages from April, 1940, to December, 1940. In its decision the court said:

"In the present case the contract regular rate was not fictitious or illusory. On the contrary it was legally established by defendant and later agreed upon by the union in the contract of May 2, 1939. Overtime was actually paid at one and one-half times the bona fide regular rate, and employes who worked no overtime received only the regular rate of pay. . . . The adoption of the split-day plan was demanded by the union because it was advantageous to employes who were required for any reason to lay off work. It penalized no one but the defendant. It would be incredible if the mere use of the word 'split-day' would have the magic power to render illegal a labor contract which was previously legal, even though wages paid thereunder remain the same or were increased. . . . I conclude that defendant's dealings with its employes were lawful and in good faith, and that plaintiff and the other employes on whose behalf he sues are not entitled to recover."

Coal Prices—Manpower

Bituminous coal producers of the country are now awaiting the approval of Economic Stabilization Director William H. Davis on price increases which are understood to have been recommended for some of the districts by J. H. Reppert, coal pricing executive of OPA. This anticipated action is the result of conferences held with Bituminous Coal District Advisory Committees in Washington on July 23, 24 and 25. These conferences in turn were prompted by strong protests made not only by operators, miners and representatives in Congress from Western Pennsylvania's District 2, but also by a vigorous organized protest from the same elements in District 8, comprising southern West Virginia, Virginia and eastern Kentucky and Tennessee.

Strong representations of the serious needs for the return to the mines of approximately 10,000 soldier-coal miners subject to the Army point discharge system, and 20,000 additional soldier-miners have also been made to the War Manpower Commission, War Production Board and War Department. Thus far the urgent requests have been unavailing as Acting Secretary of War Robert P. Patterson states that industrial relief is being sought for loggers, steel workers, railroad workers, foundry workers, mechanics, textile workers, metal miners, farmers, etc.—that all offer appealing reasons, and that "if we authorize the discharge or furlough of all of those for whom requests have been made we would have to release as many as one million men from the Army."

Testifying before the Senate Special Committee to Investigate the National Defense Program on July 31, War Fuels Administrator Ickes warned that the anticipated 25 million ton shortage in coal production may limit war plants to a four-day week this winter and again urged that the Army proceed with all speed to furlough 30,000 coal miners for return to the mines. Ten days previously Ickes had advocated the shipment of six million tons of American coal to European countries, stating that "the race in Europe today is one between coal and anarchy." He expressed regret that action had not been taken to organize coal production and transportation in the European countries in line with the recommendation of Deputy Solid Fuels Administrator C. J. Potter following a personal survey of the situation in Europe four months ago.

Personals

L. C. Graton, professor of mining geology at Harvard and a consulting geologist, was recently elected a director of Cerro de Pasco Copper Corporation.

R. Livingston Ireland, Jr., who is president of the Hanna Coal Company and vice president of the M. A. Hanna Company, was recently elected a director of the National Steel Corporation.

In tribute to his leadership in advancing industrial science, **Clyde Williams**, director of Battelle Memorial Institute, Columbus, Ohio, was presented the degree of Doctor of Science

Clyde Williams

at recent convocation ceremonies of the Case School of Applied Science, Cleveland, Ohio.

The degree was presented by **Dr. William E. Wickenden**, president of Case, who cited Mr. Williams' accomplishments in research administration and in directing the activities of the War Metallurgy Committee of the National Academy of Sciences and the National Research Council.

Edwin Jones and **C. O. Gabany**, superintendents of mines for the West Virginia Coal and Coke Corporation, have recently been listed by the West Virginia Department of Mines among 16 superintendents whose mines had produced more than a million tons of coal since their last fatality up to January 1, 1945.

Clifford McIntosh has been appointed chief engineer of the Great Northern Iron Ore properties on the Mesabi iron range. He was formerly chief inspector for the company.

Samuel H. Dolbear and **Charles H. Behre, Jr.**, recently announced the formation of the firm of Behre, Dolbear & Company, consultants in the mineral industries. Associated with the new firm are **H. Foster Bain, J. F. Geary, G. A. Joslin, C. C. Morfit, Walter A. Rukeyser, Herbert Waterman** and **W. F. Boerike.**

Leslie S. Taylor, formerly employed by the National Lead Company, is now mill superintendent with the Ancor Corporation.

Norman W. Lee, who is owner of the Independent Operators Sales Company of Arlington, Va., which owns and controls mines of half a million tons annual capacity, has been elected president and general manager of the Atlantic Smokeless Coal Co., Asco, W. Va. Mr. Lee also operates the Queen, Towan and Hinkle mines in West Virginia.

A. S. Knoizen, of Franklin, Pa., was elected a director of the Reliance Electric & Engineering Co., Cleveland, Ohio, at a meeting of the board, June 28, 1945. Mr. Knoizen is executive vice president of the Joy Manufacturing Company and the Sullivan Machinery Company. He is also the director of the Mining Division of the War Production Board.

Neil M. Gibson, who has been with the geological department of the Bethlehem Steel Company for two years, has again returned to the West Coast to reenter gold dredging operations.

Carl Brewer, formerly chief mining engineer for the Cleveland-Cliffs Iron Company, was recently assigned new duties in charge of all records for the company's extensive mineral lands. **Grover J. Holt**, formerly assistant chief engineer, will now act as chief engineer of mining operations in Minnesota and Michigan.

Howard R. Hendricks was recently promoted from the position of superintendent of the Shattuck Denn mill to chief metallurgist for the Shattuck Denn Mining Corp. His metallurgical staff will supervise all the corporation's milling projects in Arizona.

D. W. Buchanan, president of the Old Ben Coal Corporation of Chicago, was recently elected a member of the board of directors of the Chicago and Eastern Illinois Railroad. He succeeds **Chester L. Jones**, recently resigned.

C. J. Flippen, who was formerly director of safety for the Norfolk and Western fuel mines, recently resigned to become labor commissioner of the Kanawha Operators Association at Charleston, W. Va.

R. C. Allen of Cleveland, Ohio, has been appointed deputy vice chairman of the Office of Metals and Minerals, War Production Board. This is Mr. Allen's second connection with WPB.

When the board was formed in January, 1942, he became deputy director of the Steel Division in charge of raw materials. He resigned in August, 1942, to give more time to his duties as vice president of Oglebay Norton & Company.

Earl R. McMillan, formerly mining engineer with the Northwestern Improvement Company, has been appointed assistant manager of coal operations and chief engineer with headquarters in the Smith Tower, Seattle, Wash., according to announcement by **J. M. Hughes**, vice president.

Major Stephen T. McGinnis, after three years in the Army Air Forces, has returned to his former position as assistant director of public relations, Tennessee Coal, Iron and Railroad Company.

Prof. William C. Krumbein, geologist of the University of Chicago, recently received the Meritorious Civilian Award of the War Department for his work in the preparation of amphibious landings on various Japanese islands.

Pierce Management, Inc., Scranton Electric Building, Scranton, Pa., has announced that **J. W. Woomer** of Wheeling, W. Va., has been elected vice president as of July 1, 1945. Mr. Woomer will continue as head of J. W. Woomer & Associates with offices in Wheeling.

The degree of Doctor of Fine Arts honoris causa was conferred by Ithaca College upon **George E. Stringfellow**, vice president of Thomas A. Edison, Inc., at the June 1 commencement. The degree is in recognition of his outstanding activities in industrial and civic affairs. Dr. Stringfellow in presenting the commencement address spoke with great inspiration on "Integrity—Man's Greatest Asset."

Henry G. Schmidt, chairman of the board of North American Coal Corporation, Cleveland, was elected president and chief executive officer at the annual meeting of directors, June 26. Directors also abolished the position of board chairman, vesting its duties in the president.

At the same time the resignation of **O. C. Larsen**, president since July, 1938, was announced, terminating a tenure of service which he began on January 1, 1916, as a clerk in the accounting department.

Mr. Schmidt, who continues as president of all of North American's subsidiary companies, joined the organization as board chairman July 1, 1942, having previously been with Goodyear Tire & Rubber Co. as manager of its engineering staff and in charge of power plants and coal mines.

Benjamin F. Fairless, president of U. S. Steel Corporation of Delaware, recently announced the resignation of **Avery C. Adams**, vice president—sales. At the same time, he announced that **David F. Austin**, vice president in charge of sales of Carnegie-Illinois Steel Corporation, had been appointed acting vice president—sales.

Lt. William G. Polk, Jr., after serving as an administrative officer in the Army Air Forces, has been placed on inactive status by the Army and has been elected secretary and director of the Block Coal & Coke Company, Knoxville, Tenn.

E. J. Hergenroether, recently resigned chief of the Metallurgical Branch of the Steel Division of War Production Board at Washington, D. C., has resumed his duties with the Development & Research Division of The International Nickel Company, Inc., New York, according to **T. H. Wickenden**, manager of that division. Mr. Hergenroether will be in charge of the division's automotive steel development and will make his headquarters in Detroit at the company's field office there.

J. L. Nelson, superintendent for Scott Mining Co., in the Tri-State area, resigned from active mining work as of June 1. He has also been superintendent for Vinegar Hill Zinc and Century Zinc in the district.

Stanley C. Harvey, formerly Utah state coal mine inspector, has resigned to become safety supervisor for the Utah Fuel Company. He will direct safety activities in the Sunnyside, Clear Creek and Castle Gate mines.

J. W. Still, for the past 18 months in Government work in Washington, D. C., and previously in the Philippines, has been appointed mine superintendent of the Miami Copper Company. He served with the company from 1921 to 1930, and was later general manager for the Bagdad Copper Company in Arizona.

H. A. Dierks, formerly a mining engineer for East Bear Ridge Collieries Company, under the J. H. Pierce management, is now mining engineer for the Glen Alden Coal Company in Scranton, Pa. He succeeds **A. H. Lewis**, recently retired.

Mark Gemmill, Prescott, has been appointed a member of the Arizona Copper Tariff Board, by Gov. Sidney P. Osborn. He succeeds **V. A. Hale**, also of Prescott. Other members of the board, reappointed, are: **Sam H. Morris**, Globe, chairman; **E. G. Dentzer**, Greer; **Lin B. Orme**, Phoenix; and **Charles R. Kuzell**, Douglas.

Donald M. Smith, assistant superintendent of maintenance for the Hudson Coal Company, has been made maintenance engineer for the Koppers Coal Division, Pittsburgh, Pa. He has been a Hudson employe for 22 years.

H. S. Martin, formerly general manager of the potash mining operations of International Minerals & Chemicals Corporation at Carlsbad, N. Mex., was recently elected president of the Southern Phosphate Corporation operating in the pebble phosphate fields of Florida.

Frank Hamilton has been elected by the board of directors to serve as assistant to the president of the Freeport Sulphur Company's subsidiary, Nicaro Nickel Company.

Theodore O. Phillips, formerly publicity representative with the New York, New Haven and Hartford Railroad, has joined Bituminous Coal Institute in a similar capacity.

B. R. Coil has been appointed general superintendent of the Miami Copper Company and Castle Dome Copper Company's operations in the Globe-Miami area, according to a recent announcement by **R. W. Hughes**, general manager at Miami. **J. C. Van de Water** has been promoted to superintendent of the Castle Dome mine.

Walter S. Larsh, assistant general manager, Nevada Mines Division, Kennecott Copper Corporation, has succeeded **John C. Kinnear** as general manager.

G. S. Crane, formerly vice president in charge of sales, Cutler-Hammer, Inc., has been elected president of the company.

— *Obituaries* —

Senator James G. Scrugham, 65, died June 23 at San Diego, Calif. A mechanical engineer, he was professor of mechanical engineering and later dean of the engineering college, University of Nevada. He had been state

engineer and governor of Nevada and in 1932 was elected to Congress. He became U. S. Senator in 1942 and was widely known as a strong advocate of the stockpiling of strategic and critical minerals and metals for the national defense.

Tindall Evans, 74, who retired in 1937 after 22 years as president and general manager of the Cananea Consolidated Copper Company of Sonora, Mexico, died on May 30 in his home in Phoenix, Ariz. He joined the Cananea company in 1902, and except for several years prior to 1915 while manager of the Mine and Smelter Supply Company of Denver, spent his active life with the mining concern.

Homer G. Turner, research engineer of the Anthracite Equipment Corporation, died suddenly while on a business trip in Erie, Pa., on May 17, 1945. Mr. Turner had been connected with the Anthracite Equipment Corporation since 1934, making his headquarters at State College, Pa.

Myron J. Czarniecki, 53, vice president in charge of sales for A. M. Byers Co., died June 18 at his home near Pittsburgh. Mr. Czarniecki started with Byers in 1913. He became manager of the company's Chicago sales office in 1919, and held various positions until he was advanced to general manager of sales in 1930. He was elected vice president in charge of sales in 1934.

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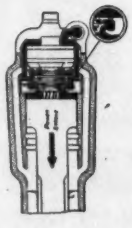
Made in 3" and 3½" diameter cylinder bore models for light and heavy duty drilling, with hand or power feed. Thor Drifters can be furnished to take a variety of sizes and types of steels and mountings. For full specifications on these and Thor Sinker and Stoper Rock Drills, write for catalog No. 42A.



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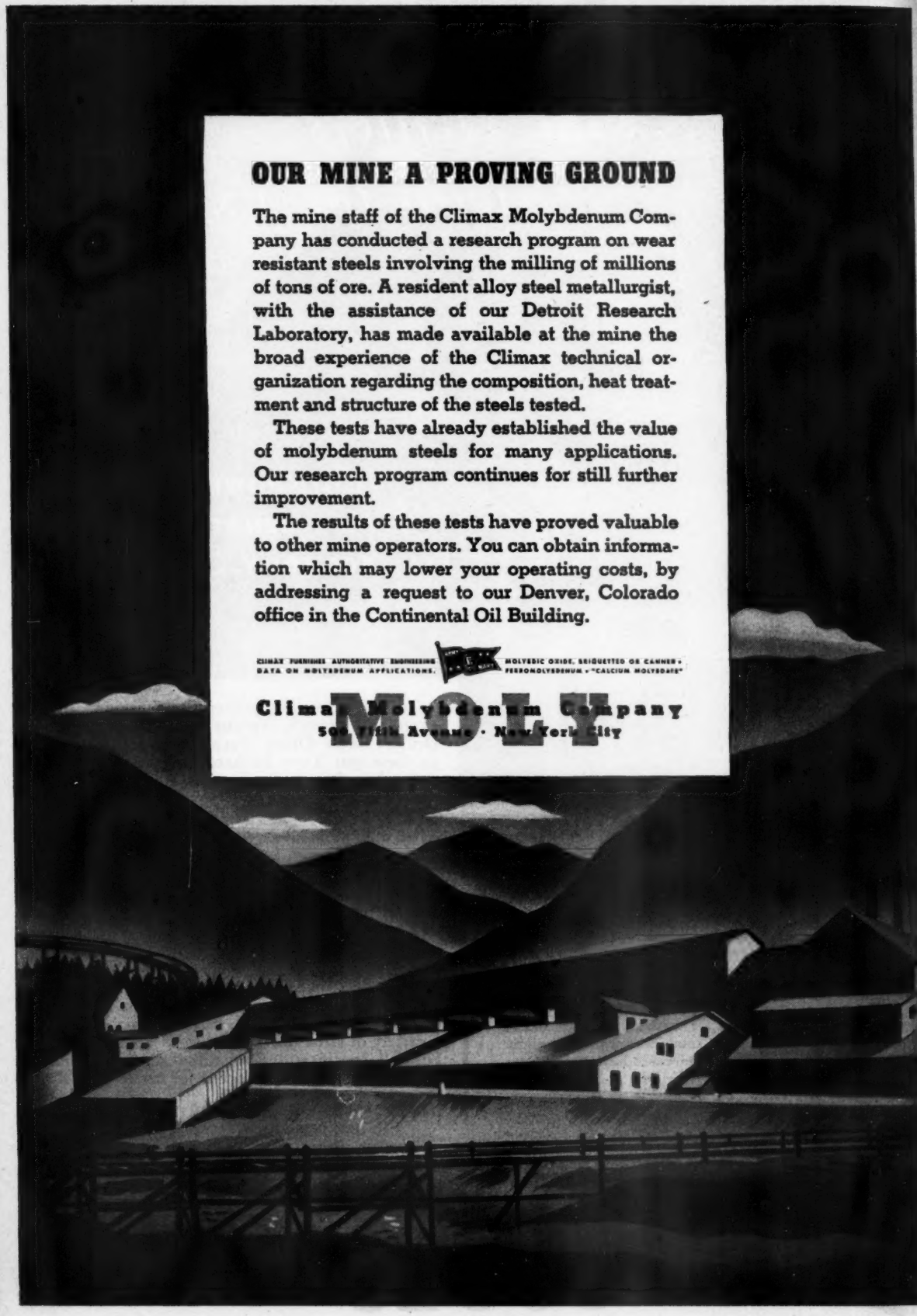

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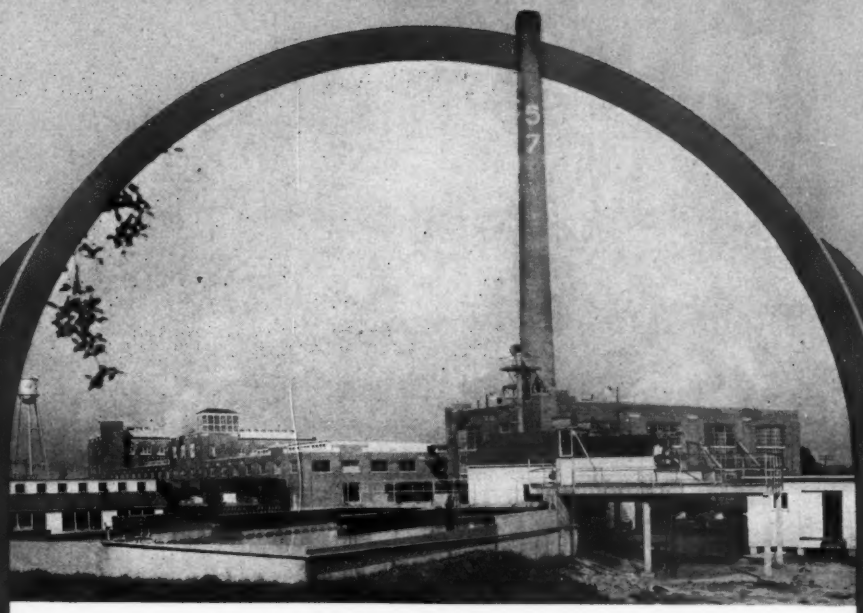

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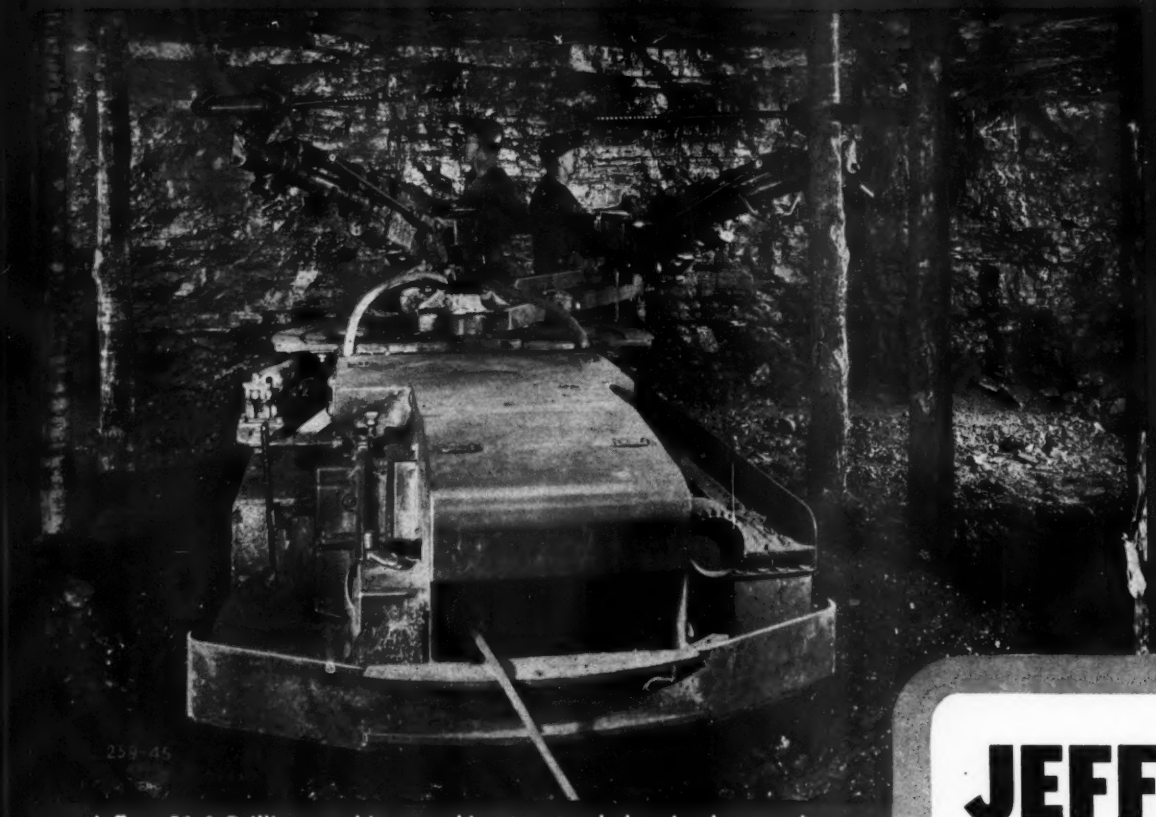

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to meet a specific operating
operating views illustrate
bility of our line.

Jeffrey A-6 Post Drill—making a top hole.

REY *Drills*

uately the requirements of Jeffrey builds a complete ipment—each unit designed operating condition. These llustrate the wide adapta-

Jeffrey A-7 Hand Held Drill—hole being drilled in low-seam operation.

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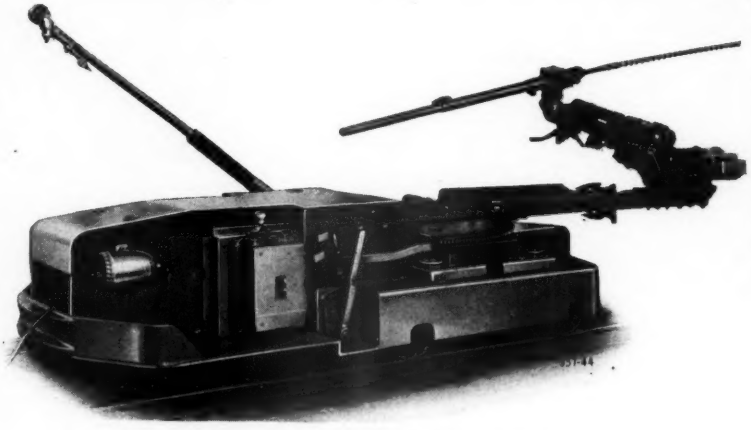
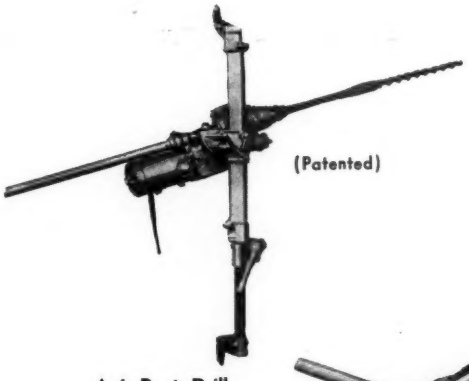


56-A Drilling Machine (Patented)



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NEWS and VIEWS

All eight of Mrs. James W. Odom's sons—former bituminous coal miners of Boissevain, W. Va., are in the service. Six are the Navy, one in the Army and one in the Marines. Six of the eight are now overseas with two in the Pacific. Their names are Howard, Harry, Bill, Ralph, Ray, Emerald, Richard and James. Mrs. Odom's husband is a bituminous coal miner, too

—Hamilton Wrig

Eastern States

Mines Distribute Vacation Bonus

Under the anthracite industry's new wage agreement 70,000 eligible employes of the anthracite companies will be paid in the neighborhood of $7,000,000 in back pay and vacation bonus during the next few months. Approximately $5,000,000 is currently being distributed as a vacation bonus. The vacation bonus is set at $75 per miner a year.

250 Bootleg Breakers Abandoned

According to a new survey of the Anthracite Committee, the number of breakers preparing bootleg-mined coal for market as of June 1, 1945, stood at 99 as compared with 339 on March 31, 1941. The production of some of these breakers was wholly bootleg whereas of others this was only a fraction of their output. During the past few months, 110 bootleg breakers have been torn down and 138 more suspended operations.

During the first five months of 1945, the average monthly production of bootleg-mined coal was 835 tons per breaker.

Bootleg production in 1944 was likewise less than one quarter of its 1941 tonnage, or from 6,300,000 tons in the calendar year 1941 to 1,332,957 tons in 1944.

On the other hand, the fatality rate has risen from one for every 103,379 tons illicitly mined in 1941 to one for every 63,474 tons in 1944.

Bootleg Production

1941	1942	1943	1944
Tons	Tons	Tons	Tons
6,300,000	3,930,578	1,924,110	1,332,957

New Prospect Colliery Pumping Plant

The installation of a new pumping plant, completely automatic in its operation and having an ultimate capacity of 5,600 g.p.m., is in progress at The Lehigh Valley Coal Company's Prospect Colliery.

Plant will consist of one 2,800 g.p.m., single stage, double suction, volute pump, driven by a 150 h.p., 2,300 volt, 1,760 r.p.m. motor, which will deliver its water through a 12-in. transite pipe a distance of 1,400 ft. with 150 ft. lift to a 2,800 g.p.m., 700-ft., 4-stage, centrifugal pump, driven by a 600 h.p., 1,185 r.p.m., squirrel cage, induction motor. This pump, acting as a booster pump, will in turn discharge the water to the surface 700 ft. above, through a 16-in. lead-lined pipe encased in a 23-in. bore hole.

The plant provides for a duplicate installation. Due to the weight involved, the 16-in. lead-lined pipe will be lowered into the bore hole in two sections which will be joined together by flanges screwed on the pipe ends at an intermediate point at which the bore hole is accessible.

Mines Returned to Owners

On June 23, Solid Fuels Administrator for War Harold L. Ickes terminated Government possession of 356 anthracite mines.

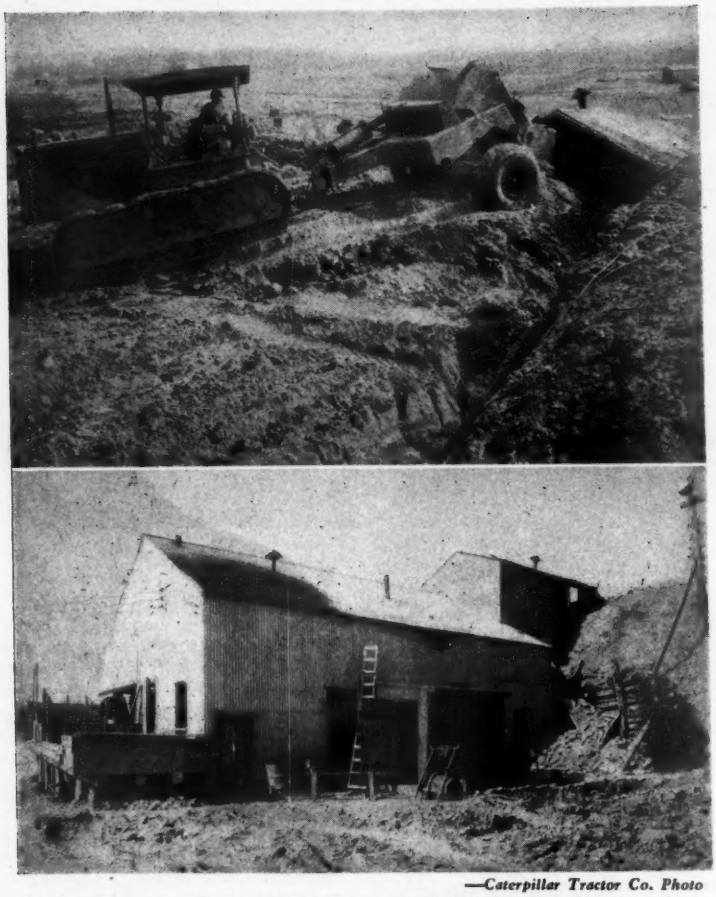
Pointing to the nation's critical need for additional anthracite, in issuing the turnback order, Administrator Ickes called upon miners and operators to increase production under their new contract as a means of recouping every possible ton of the output lost due to strikes from May 1 to May 21.

Princess Dorothy Builds New Plant

The Princess Dorothy Coal Company leased in April, 1944, 6,000 acres of coal land from the New River and Pocahontas Consolidated Coal Company. The tract of land is located on the West Fork of Pond Fork of Little Coal River, approximately 20 miles above Madison, in Boone County, West Virginia.

Construction of a modern plant, including a five-track tipple, will be completed and the mine placed in operation in July, 1945. Potential production will be 1,000,000 tons per year from the Number 5 Block bed.

The Princess Dorothy Coal Company has been working, under lease from the Chesapeake and Ohio Rail-



—*Caterpillar Tractor Co. Photo*

Rutile mining operations at the American Rutile Corporation's Hanover plant, Beaverdam, Va. A caterpillar D7 tractor with LaPlant-Choate scraper loads ore for the screening and crushing plant. This latter obtains its power from a caterpillar D8800 electric set

way Company, mines at Eunice, Raleigh County, West Virginia, for several years. The annual production from these mines is approximately 1,000,000 tons from the Number 5 Block and Dorothy (Winifrede) coal beds.

American Coal Acquires New Lands

The American Coal Company of Alleghany County, the largest coal producing company in Mercer County, with mines at Crane Creek, Pinnacle and Piedmont, post office McComas, W. Va., announces the acquisition of a new lease in the neighboring area of the Number Three Pocahontas Coal Seam which virtually insures the continuance of employment and industry to this section for several decades. During the past two years or more this company has been exploring the upper and other seams of coal in the area in which they have been mining since right after World War I, and the tonnage of a million and a half tons a year has been maintained by the resourcefulness of the management headed by H. F. Warden, general manager, and H. W. Payne, general superintendent, plus a competent staff of engineers, accountants, foremen, and other qualified men. Now the assurance of the continuance of the production of Pocahontas Coal by this company is good news to a lot of people locally and in the market territory. The lease is on the lands of the Pocahontas Land Corporation, which controls the bulk of the Number Three Pocahontas coal in the ground.

The American Coal Company is known as an Atwater company having been developed by W. C. Atwater, the late founder of Wm. C. Atwater and Company, which is the sales agency that will market the new coal. The mining company is one of, if not the oldest, coal producing companies in America, having been established in 1851 and in continuous operation since. Its reputation is world wide, and includes in its facilities ocean and lake vessels, wholesale and retail coal yards in various cities, and very diversified interests connected with the fuel industries in many markets. John J. Atwater, president, Geo. Dies, secretary, joined J. J. Lincoln, chairman of the board, W. G. Stephenson, Roanoke, Va., James A. McQuail, H. F. Warden, Paul Pack, Wm. Beury, and other directors recently confirmed the lease and signed the necessary papers to prolong the history of the company.

Canal Project Promoted by Big Sandy Association

Williamson, W. Va., and Pikeville, Ky., in the mountain coal country, may sooner or later have outlets by way of water to sea as the Big Sandy Valley Association is so trying to convince the United States engineers and Congress. The project calls for development of a 200-mile canalization up the Big Sandy and the Tug River and Levisa Creek. The principal objective is a water outlet which would permit barges to handle coal, lumber and other supplies from the hill country to the Ohio River.

Attention is called to certain developments during the war which makes the project more feasible. For example, 315-ft. L.S.T. tank landing barges were constructed at various shipyards on the Ohio River where they were launched sideways, and equipped to go down the Ohio and Mississippi Rivers to join the United States fleet. It is also noted that parts of ocean-going vessels have been fabricated in the Rockies at Denver and elsewhere. It is believed that river transportation into the coal country of eastern Kentucky by ways of locks and dams would not only be a great aid to the coal industry but would provide flood control as well.

Atlas Proposes $400,000 Laboratory Expansion

An appropriation of $400,000 for the construction of new units to expand the Wilmington research facilities of Atlas Powder Company was approved by the board of directors of that company at a meeting June 6, according to M. J. Creighton, general manager of the Industrial Chemicals Department. "Application will be made at once to the War Production Board, and construction of the new facilities will go ahead as soon as their approval is received," Mr. Creighton stated.

"The proposed new buildings will be designed for process development on

a semi-works scale, to work out methods of manufacture preparatory to large scale manufacture. Thus, new chemicals are carried from the experimental stage through small pilot plant operation to final production.

"Kenneth R. Brown is director of the Research Department. The present facilities at our Central Research Laboratories, located at Rose Hill between Wilmington and New Castle, are under the direction of Dr. R. S. Rose, Jr. These facilities are heavily engaged in war work at the present time. Although these laboratories were completed and opened for use little more than a year ago, they are already inadequate to meet requirements. Accordingly, we are applying for permission from the WPB to construct four more buildings at Central Research Laboratories so that we may more completely carry on work under way, and begin work on some of the things planned for the future.

"The new units will be concerned with the development of organic chemicals and their uses. Research on explosives will remain at Reynolds Experimental Laboratory near Tamaqua, Pa. Research will continue on coated fabrics and industrial finishes at Stamford, Conn."

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1944 Sentinels of Safety Awards

WORKING nearly 6,500,000 man-hours in 1944 without a disabling injury of any kind, the employes and officials of 84 mines and quarries in the United States have been cited for outstanding safety records by Dr. R. R. Sayers, director of the Bureau of Mines, who announced the six winners of the "Sentinels of Safety" trophies in the 20th annual National Safety Competition conducted by the Bureau.

The 84 accident-free operations were among 373 mines and quarries in 36 states participating in the competition last year, Dr. Sayers stated, adding that this remarkable accident record in the mineral industries was achieved despite wartime handicaps such as greatly increased production, loss of skilled workers to the armed forces and other industries, and inability to replace badly worn machinery.

Sentinels of Safety trophies, provided each year for this contest by the *Explosives Engineer* magazine, were awarded to the top-ranking mines and quarries in the six classifications. In addition, certificates of honorable mention were awarded to 69 mines and quarries for working 30,000 or more man-hours without an accident or for ranking among the first five in each group.

Inaugurated in 1925 to promote safety in the mines and quarries of the nation, the safety competition has increased in importance during the war years because of the essential role that accident-prevention activities play in protecting manpower and in curbing interruptions in the production cycle.

The six trophy winners in the various classifications are as follows:

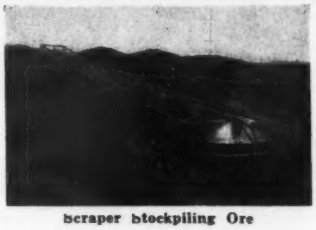
Underground Metal Mines — Newport iron-ore mine of the Youngstown Mines Corporation at Ironwood, Gogebic County, Michigan, for working 599,262 man-hours without a lost-time accident.

Open-cut Mines—The Danube iron-ore mine of the Pickands, Mather & Company (Balkan Mining Company) at Bovey, Itasca County, Minnesota, for working 364,558 man-hours without a lost-time accident.

Stone Quarries—The Maple Grove dolomite quarry, of Basic Refractories, Inc., at Maple Grove, Seneca County, Ohio, for working 325,147 man-hours without a lost-time accident.

Underground Nonmetallic Mineral

DIG *and* HAUL *at* LOWEST COST



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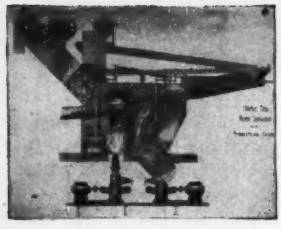

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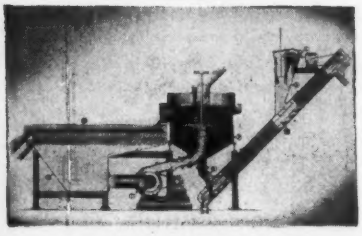

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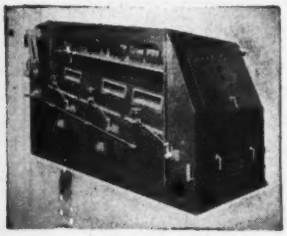

For dry cleaning fine coal

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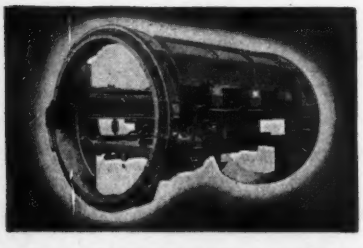

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Underground Bituminous Coal Mines—The "D" mine of the Union Pacific Coal Company, at Superior, Sweetwater County, Wyoming. Worked 81,650 man-hours without any lost-time accidents.

Underground Anthracite Mines—The Miles Slope mine of the Hudson Coal Company at Dickson City, Lackawanna County, Pennsylvania. Employes worked 229,496 man-hours with only three lost-time injuries causing 12 days of disability, and an extremely low accident-severity rate.

1943 Minerals Yearbook Available

VICTORY in Europe and the consequent relaxation of the Bureau of the Budget's security regulations permits the release for public distribution of the heretofore confidential 1943 Minerals Yearbook, Dr. R. R. Sayers, director of the Bureau of Mines, has announced.

The Minerals Yearbook, the Nation's most comprehensive and authoritative publication on the production, distribution, and consumption of mineral commodities, has been compiled and published annually for many years by the Economics and Statistics Branch of the Bureau. Containing foreign trade information and other data that might have been of value to the enemy, editions published thus far during the war have been withheld from general distribution until now.

Bound copies of the 1943 Yearbook now may be obtained for $2.50 each from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. A limited number of copies of the 1942 edition, also released recently, likewise are available at $2.25 each, together with certain separately printed chapters priced from 5 to 15 cents.

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"Engines With Ears" Industrial Version of Army "Walkie-Talkie"

FIVE "engines with ears" are pulling their switching orders out of thin air and saving hours each day in the handling of vital wartime rail traffic at the East Pittsburgh plant of Westinghouse.

Equipped with mobile FM radio sets in an industrial version of the Army's "walkie-talkie," the Diesel-electric locomotives roll over 25 miles of company-owned switchtracks, their crews in constant radio communication with the yard office.

Recently put into operation, the new static-free radio communication system which allows engineers to talk to the yard office and receive orders while "on the run," proved its worth quickly.

"During the first test, a locomotive was in a remote part of the switchyards when a hurry-up car movement order was received at the yard office," W. C. Rowland, factory service manager, related. "We contacted the engine and found it was almost alongside the car wanted and the orders were given. Had the engine come to the yard office, obtained its orders and gone back out through a yard in which many switches had to be thrown, the moving of that one car would have taken several hours. As it was, it took only a few minutes."

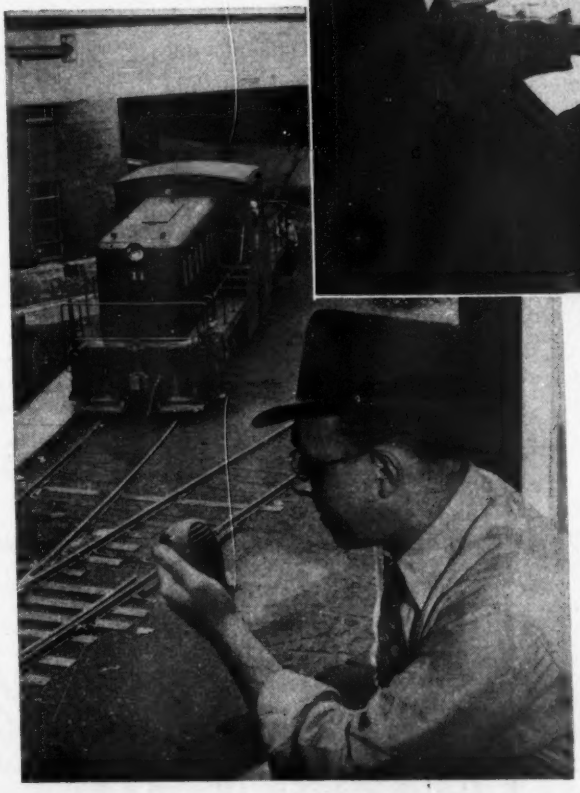
The little "network" which consists of the five mobile stations on five locomotives and one stationary transmitter and receiver set in a building near the yard office is believed to be the first such frequency modulation system put into use by a private industry. Westinghouse officials revealed that engineers also will use the system as a basis for further experiment in the field of train-radio communication.

Station on Famous Site

Coincidentally, the stationary transmitter of this ultra-modern railway communication system is located in the Westinghouse "K" building, site of another famous first in the radio field. From this building on November 2, 1920, results of the Harding-Cox presidential election were broadcast over KDKA—the first regularly scheduled broadcast in history.

Frequency modulation radio was chosen for the new adaptation because of its elimination of static. In the highly industrial Allegheny River Valley where the switch engines operate, thousands of electrical machines might cause amplitude modulation radio communication to be virtually blotted out with static when radio-equipped locomotives passed beside the buildings they are in.

In tests thus far, Mr. Rowland reports, the FM communication broadcasts have come through with great clarity even from the remotest switchtracks or when locomotives are inside buildings.



Above: Howard C. Dudley, yard office operator of the new FM train-radio communication system of the Westinghouse Electric Corporation, is shown at the "mike"

Engineers in Westinghouse East Pittsburgh yards don't stop to pick up orders. They receive them via FM radio from the dispatcher. The new system saves many hours of switching time

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Central States

Blue Bonnet Sinks Two Shafts

Blue Bonnet Mining Company is sinking two new shafts on the old Empire land and is making preparations to start the old Eagle-Picher Navy Bean mill, three miles west of Wentworth, according to reports. James F. Haffney of Dallas is head of the new company.

Blue Bonnet has 600 acres of mining land under lease in the Wentworth area, and plans to dewater the old Navy Bean mine to reopen the underground workings.

Ray Ballinger will be in charge of sinking the two new shafts on the Empire, one of which will be about 50 ft. deep and the other 90 ft. Reconditioning of the 40-ton-an-hour concentration plant, will be in charge of Oscar Told, superintendent.

Four-Mile Builds New Mill

Four-Mile Mining Company, which has opened a new zinc mine on Four-Mile creek, about six miles west of Picher, is said to have acquired the Peck mill on the S. Abrahms land, north of Quapaw and east of U. S. Highway 66, and is moving the equipment and building material for reconstruction of the plant at the mine site.

The new development is the farthest extension of the great Picher field to the west, with the exception of that of the United Zinc Smelting Corporation on the Park-Walton lease, situated some two or three miles farther west.

The Four Mile company's new shaft is situated on the west side of Four-Mile creek and north of an extension of West A Street out of Picher. V. A. Walters of Picher and associates are interested in the new development.

Cherry Valley Hematite Dumps Thought Recoverable

Study of the Cherry Valley hematite dumps accumulated from former iron mining activities near Steelville, Mo., has indicated that 50,000 tons of recoverable ore exists there which will give a product of 50 percent iron or better. The United States Bureau of Mines has made the study and the recovery method recommended includes the use of log-washers and jigs. The Cherry Valley property is owned by Herman Lark of Steelville.

Reopen Silver Mine at Fredericktown

It has recently been reported that the Einstein silver mine, lying about 10 miles west of Fredericktown, Mo., is being reopened and that exploration work has begun. The mine is also reported to carry some tungsten. Fredericktown has witnessed several other important mining ventures recently. Park City Consolidated Mining Company is recovering lead from the Ruth mine and is operating a mill. At this operation, Al Reiser is in charge as superintendent and Nolan Probst is mine foreman.

St. Louis Smelting and Refining Company is working three shafts and is making concentrates of lead, cobalt, copper and nickel. This operation is in charge of Jean McCallum. The Fredericktown Lead Company is producing lead under the supervision of Ewart Petley and Mine LaMotte continues operation for the St. Joseph Lead Company with R. Murrell in charge.

Zinc Activities Near Harrison

The S. & G. Company, operating the Hurricane mine near Pindall, is reported to be in steady operation although recent activities had been curtailed first through lack of water for milling operations and more recently because of heavy rain. High grade carbonate concentrates, in addition to the one car already shipped, may be affected be-

Liquid oxygen charges being loaded in the stripping bank at an Oakland, Ind., coal strip mine

cause of the water supply brought in by the heavy rains.

The Arkansas Mining and Refining Trust Company, which operates the North Star mine near Harrison, has shipped 6 carloads of mine-run zinc sulphide according to April reports. The ore is said to assay approximately 5 percent and is being shipped to the St. Louis Mining and Milling Company at Joplin, Mo. Six more carloads are now in the bins ready for shipment. Production has been increased effectively through installation of a new picking belt and loading ramp.

Magnet Cove Barium Acquires Leo Yount Holdings

The barite holdings of Leo Yount in southern Montgomery county, Ark., were recently acquired by the Magnet Cove Barium Corporation of Malvern. Although definite plans for mining have not yet been announced, it is expected that open pit operations will be started at an early date. Exploration work has been carried on this property by the U. S. Bureau of Mines by means of diamond drilling and surface trenching since late January, 1945.

Bauxite Exploration Said Near Completion

Nine million three hundred seven thousand tons of bauxite ore, of a grade suitable for direct use by industry for metals, abrasives and chemicals, has been blocked out in Pulaski and Saline counties, Ark., by the U. S. Bureau of Mines exploration which covered an area of some 1,400 square miles. Geophysical surveys were made in 7 counties but the bulk of the reserves were delineated in Pulaski and Saline counties. At one time, 20 drilling crews were in the field carrying out this work. With the project nearing completion, however, only 12 crews are now handling the drilling activities. It is reported that 1,300,245 ft. of holes (more than 246 miles) were drilled in this gigantic exploration project.

Aerial Photographic Survey of the Marquette Range

A joint photographic aerial survey is being made by Aerial Service Corporation of Philadelphia for the Cleveland-Cliffs Iron Company, Interstate Iron Company and Inland Steel Company. The new survey is expected to be of considerable assistance in future exploration on the Marquette Range. The pictures are being taken at an elevation of 8,000 ft. and the regular procedure of taking stereographic pairs will provide for contouring the entire area. To aid in ground references, the Interstate Iron Company has marked its corner-posts with long strips of white cheesecloth and has identified its drill holes with circles of lime. Incidentally, its diamond drill exploration still continues at the Breitung land lying just east of Negaunee, Mich. Diamond drilling exploration on this range is treated extensively in this issue on page 29.

Hearings on Proposed Ship Canal

Hearings on the proposed Michigan ship canal took place recently with Government engineers at Escanaba, and at Marquette, Mich. The proposed ship canal is planned to be cut across

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Each Hodgman garment is designed for a specific use or occupation to stand up under the most severe service conditions. All fabrics, coated in our own plant, meet the most rigid government specifications. All Hodgman garments are reinforced in the proper places, are waterproof and provide the utmost in comfort. There is a Hodgman garment for almost every industrial use.

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I-T-E Tonnage Improvers

Consistent study of mining problems has maintained I-T-E leadership in air circuit breakers and switchgear for use with mechanized practices. Investigate these items which protect against shut-downs and fire hazards.

AUTOMATIC RECLOSING CIRCUIT BREAKERS . . . with load measuring characteristics are widely used where d-c trolley and feeder systems are employed or wherever overload peaks and faults arise frequently.

TYPE KSA is for substation use in protecting and controlling automatic or semi-automatic m-g sets, rotary converters and mercury-arc rectifiers.

TYPE KSC is used in sectionalizing service to localize faults to maintain maximum production at reduced cost for power, maintenance and repairs.

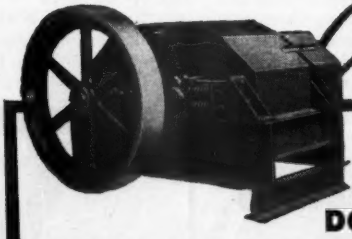
LOAD DISTRIBUTORS . . . for panel mounting in glass front, dust-proof case, improve service from two or more m-g sets or rotary converters in parallel on same system but at widely separated locations. Generator loads are balanced to prevent over-heating, outages are reduced, peaks are limited and life of equipment prolonged.

AUTOMATIC SWITCHBOARDS . . . for automatic protection and control of motor-generator set and rotary converter substations. Much of the equipment, including circuit breakers and protective relays, has been designed specially for mining service. Mounting is simplified and there is much flexibility in space arrangements.

For full details, write today for Bulletin 2502. I-T-E CIRCUIT BREAKER COMPANY, 19th & Hamilton Sts., Phila. 30, Pa.

I-T-E *Representatives in Principal Mining Areas* **AIR SWITCHGEAR**

WHEN THE PROBLEM IS *Crushing*



INSTALL MARION DOUBLE ROLL HEAVY DUTY COAL CRUSHERS

● **Increase the market value of your coal by preparing it in demanded sizes with *Marion Coal Crushers*. Rolls adjustable for different size products. Least expensive to own and operate, they give quick return of purchase price and up profits. Sheet steel enclosures for clean, safe operation. Capacities from 22 to 400 TPH. Fly Wheel Pulleys are standard equipment, but gears can be furnished for direct connection where space for belt drive is lacking. Special drives to suit conditions. Just lay your problem in our engineers' laps!**

Your Coal is no Better than Your Crushing Equipment!

***Marion Coal Crushers* have been in use in various designs for over 30 years. Constantly improved, they pay dividends in low-cost, efficient production in thousands of mines. Have this sturdy, trouble-free equipment!**

Write for Specifications and Prices Today!

THE MARION LINE

MARION MACHINE, FOUNDRY & SUPPLY CO.
MARION, INDIANA, U.S.A.

Michigan's northern peninsula connecting Au Train Bay on Lake Superior and Little Bay de Noc on Lake Michigan. Au Train Bay is just west of Munising, Mich., and Little Bay de Noc is just north of Gladstone. The proposed route runs approximately north and south through Alger and Delta counties.

Palms-Anvil Diamond Drills Blast Holes

Diamond drilling of blast holes is being tried out at the Palms-Anvil mine of Pickands Mather and Company near Bessemer, Mich., after extensive tests at the Soudan mine of the Oliver Iron Mining Company on the Vermillion Range near Tower, Minn. Reports to date indicate that the cost on hard ore is 35 percent less than when using air drills employing detachable bits. It is also reported that due to the narrowness of the ore body, a system of open stopes, using diamond drills for deep blast holes is proving more suitable than the sublevel stoping and caving system used previously. The method is said to overcome difficulties formerly encountered when mining alongside unstable footwall rock and at this phase of progress, it is also reported that more rapid drilling is insured with diamond drills than with standard rock drills.

Philippine Mine Rehabilitation

LARGE quantities of machinery will be required to rehabilitate Philippine mines as result of the Japanese occupation, was the statement T. A. De Vore, chief chemist of Marsman and Co., Manila, liberated from Santo Tomas prison camp, made recently in an address before the mining committee of the Los Angeles Chamber of Commerce.

Much of the machinery, he said, was moved to the Jap homeland, where he said the invaders had the erroneous idea that equipment for mining gold and copper could be applied in production of chrome.

Machinery not thus appropriated, he continued, was destroyed through deliberate flooding of the workings. Motors and surface tools were damaged in a systematic wrecking process when it became apparent that MacArthur was about to retake the islands.

Heavy shipments of cement, as well as machinery and tools, he explained, will be required from the United States before the Philippine mines can be put back into operation.

•HOLMES EQUIPMENT

• *Designed for . . .*

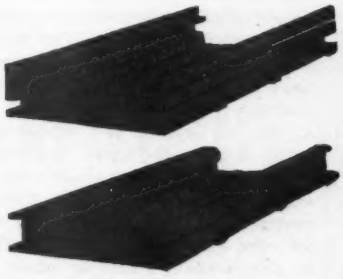
MODERN MINING

Flanged Roller

Made of either cast iron or cast steel in both single and double flanged. We also have wide range of pattern sizes of truck wheels, rollers and plain and grooved winding drums in the solid, web center, and spider types

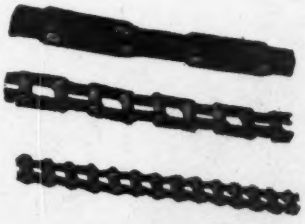
Gears

Cut tooth spur gears, racks and pinion gears, bevel gears, and equalizing gears, in a wide variety of pitch diameters and number of teeth.



Cast Iron Conveyor Bottoms

For use on wet conveyors and at other points, where corrosion problems exist. Design of these bottoms permits worn sections to be replaced by "handy-man" with wrench. Chain flights need not be removed.



Chain

All Holmes' chains are interchangeable with the chains of like numbers, that might have been secured from other sources.

Bearings

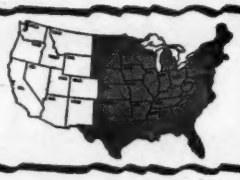
Holmes' manufacture a complete line of sheave bearings, rigid, solid, and angle pillow boxes. Our extensive equipment includes special, heavy duty bearings, and ring oiling and water cooled bearings.

ROBERT HOLMES AND BROS.

BINS - GATES - LOWERING SPIRALS - DUST-O-LATORS - SHAKING GATES

DANVILLE, ILLINOIS

Western States



A. S. & R. to Operate Custom Mill at Leadville

It is now reported that the American Smelting & Refining Co. is on its way toward expanding mining, milling and smelting operations in Colorado.

Russell P. Raynolds, who has been Colorado manager of American Smelting for many years, retired recently and J. Paul Harrison has taken his place. Harvey L. Tedrow, well known in connection with Colorado mining operations, has been named geologist and mining engineer for the company in Colorado. Recently Tedrow has been operating in Colorado's Silver Plume district.

A. S. & R. recently bought the Harner mill at Leadville. This is a 300 ton daily capacity plant and will be operated on company ores and also handle custom tonnage. The company has opened a large lead-zinc ore tonnage at its Lucky Strike property at Kokomo, Colo., and the Harner mill, a flotation plant, will separate the values with the lead concentrate treated in the company's 600 ton lead smelter at Leadville and the zinc concentrate going to the company's 300 ton zinc smelter at Amarillo, Texas. At the company's Denver plant, cadmium is being recovered from the flue dust from its different zinc refineries.

Propose Hydrogenation Plant

Preliminary steps have been taken by a special committee of the Grant County Chamber of Commerce at Silver City to secure for New Mexico a hydrogenation plant which would process coal for the production of synthetic fuel. A special committee has the proposed project under consideration. It is composed of M. R. Walton, chairman; David W. Boise, George Johnson, Frank Light and C. B. Collins and is enlisting the cooperation of all chambers of commerce in the state as well as its congressmen, senators and Gov. John J. Dempsey.

Mogollon District Expects Gold Developments

Lifting of the ban on gold mines July 1 is expected to bring about a resumption of gold and silver mining in New Mexico, particularly in the Mogollon District of Catron county, where all operations ceased in October 1942 when the mines there were shut down as a war emergency measure. When gold mining is resumed, it is expected that extensive development will start on properties hitherto not in operation with a view to opening up new gold mines.

Fluorspar Claims Sold

Announcement was made late in June at Albuquerque by William Heim and James Mallory of the sale of their New Mexico fluorspar claims in Bluewater Canyon, Valencia County, to J. E. Thompson and J. L. French, of Los Angeles, Calif., at a reported consideration of $250,000. The new owners announced plans for increasing production, most of which goes to the Colorado Fuel & Iron Company at Pueblo, Colo.

Manpower Losses Expected

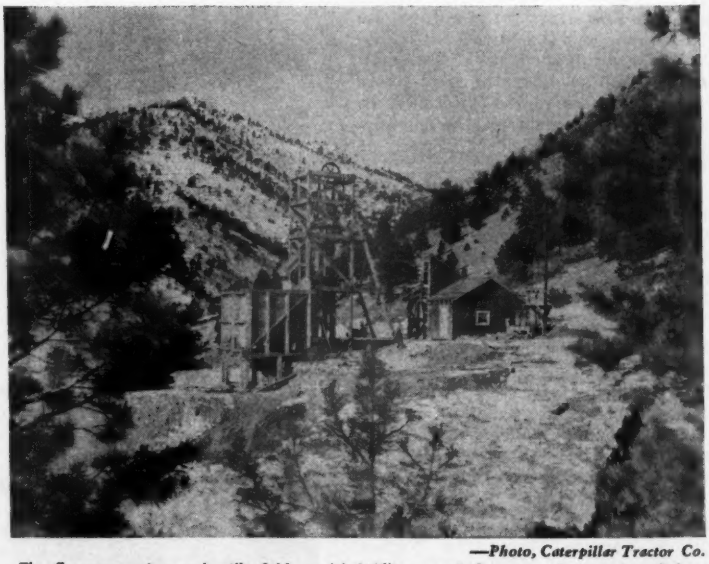
Arizona mining expects to lose between 600 and 800 soldiers, who have been furloughed to work in mines of the State, during the approaching few months, according to estimates made by George A. Ballam, field engineer for the State Department of Mineral Resources. Most of the furloughed soldiers are working in copper properties.

State mining also will lose the services of two of the mineral resources department's four field engineers. Ballam will remain active in southern Arizona, and A. C. Nebeker will be in the northern section. Elgin B. Holt, Kingman, and Andrew MacFarlane, Globe, are being retired.

NMC Approves Wage Increases

Approximately 4,300 employes of the Phelps Dodge Corporation in Arizona have been affected by voluntary wage increase agreements approved by the non-ferrous metals commission of the War Labor Board. Increases of nine to 13 cents an hour were given to all less skilled employes; virtually no increases were proposed for skilled workers. The average increase was said to be 3.39 cents. The adjustments are retroactive to March 1.

Six hundred employes of Castle Dome Copper Company, Inc., Miami, and 100 of the Eagle-Picher Mining



—Photo, Caterpillar Tractor Co.

The fluorspar mine and mill of Harry M. Williamson & Son near Jamestown, Colo. Output 100 tons daily

and Smelting Company of Tucson have figured in extra pay allotments for night shifts, granted by the nonferrous metals commission. The increase amounts to four cents an hour for second shifts, six for intermediate, and eight for third shifts, all retroactive to November 24, 1944.

Montana's Great Achievement

D. M. Kelly, vice president of the Anaconda Copper Mining Company in charge of its western operations, recently paid glowing tribute to the mines of Montana and their contribution to the nation's war effort:

"The people of Montana may take justifiable pride in the contribution which this state has made to the national war effort. I know that this effort will be continued by Montana people until the very last requirement of our military forces has been fulfilled.

"Montana has gone to war in every aspect of the state's resources and industry and in every division of those resources and industry she has set new records of production despite severe difficulties and handicaps.

"That is true of her agriculture and livestock. It is true of her mining and lumbering.

"The mining industry has accomplished what well may be regarded as the fantastic. Nearly 5,000,000,000 pounds of vital and strategic metals and minerals have gone out of this state in the last four years as a mighty part of the great array of materials needed to defeat our powerful enemies.

"This tremendous production in the mining industry, surpassing anything that was done here before, could not have been accomplished except for the splendid cooperation and the complete loyalty of the men of the mines and smelters, craftsmen and of all others who are part of this great industry.

"While there have been thousands of strikes and work stoppages in other parts of the country during this emergency period, Montana workers have left no effort undone to swell the rising stream of war supplies—that our fighting men should lack nothing that they needed. We have had no strike in the mines of Butte in 10 years."

Montana's Production for War in Metals and Minerals

Total of metals and minerals produced or refined in Montana, during the four-year period 1941-44, inclusive.

Commodity	*Pounds*
Copper	1,051,820,489
Zinc	1,723,028,475
Lead	108,437,276
Silver	3,347,276
Gold	19,898
Cadmium	7,337,577
Manganese (in nodules)	508,410,085
Arsenic	83,815,027
Sulphuric acid	623,000,000
Superphosphate fertilizer	451,491,600
Other metals and minerals	278,043,204
Total pounds	4,838,750,829

$3,000,000,000 Values Taken from the Famed Butte Hill

Total recoverable mine production of copper, zinc, lead, silver and gold from Butte Hill, 1862 to 1943, inclusive—82 years:

Copper	12,621,256,622 lb.
Zinc	3,583,975,034 "
Lead	1,330,375,904 "
Silver	733,608,644 oz.
Gold	16,886,996 "

The grand total value of this production is more than $3,000,000,000.

PARMANCO Horizontal Drills

PARMANCO Horizontal Drills are used exclusively in the Iron Range for horizontal drilling.

They are also used by a large percentage of the strip coal mines.

The new PARMANCO Vertical Drill has revolutionized test drilling.

Write us your drilling problems.

PARIS MANUFACTURING CO.

PARIS, ILLINOIS

Horn Silver Continues Production

Production is going forward from a new ore discovery in the Horn Silver property in Beaver County, Utah, at the rate of 75 tons per day, according to company officials.

The Horn Silver property is being operated under lease by the Metal Producers Associates of Los Angeles, Calif. Approximately $100,000 has been expended in reopening the old producer.

The discovery was made in a lateral extended from the 800-ft. level of the King David shaft in an unexplored part of the Horn Silver ore channel. The ore carries approximately 7 oz. silver to the ton, 7 percent lead and 7 percent zinc.

Exploration work is still being carried on to determine the extent of the ore body and the company expects to increase production to 200 tons per day in the near future.

Coal Operators Elect Officers

Election of Claude P. Heiner, vice president, Utah Fuel Co., as president of the Utah Coal Operators Assn. was announced June 23. A. B. Foulger, general manager of Lion Coal Corp., was elected vice president, and B. P. Manley was retained as executive secretary.

Directors are L. E. Adams, president, Spring Canyon Coal Co.; A. P. Cederlof, general manager, Peerless Sales Co.; Mr. Foulger and Mr. Heiner; R. H. Harmer, vice president, Hi-Heat Coal Co.; Paul Keyser, president, Independent Coal and Coke Co.; Terry McGowan, president, McGowan Coal Co.; George Schultz, vice president and general manager, Liberty Fuel Co.; P. L. Shields, vice president and general manager, United States Fuel Co.

Travel Time at Utah Copper

The Utah Copper Company, Bingham Canyon, Utah, has been directed by the NWLB to pay for travel time spent while working in the open pit mine, with the amount and method of payment to be determined by the company and the unions involved. Affected by the decision are some 1,700 employes.

The company and the unions must negotiate as to (1) the amount or method of determining the amount of travel time; (2) designated points for going on and off duty; (3) rates or ranges of payment for travel time, and (4) any other related issue. The mine produces approximately 27 percent of the nation's copper.

The National Board eliminated the NMC provision that grievances "concerning wages, hours, conditions of employment not involving the revision, renewal of renegotiation of the contract between the parties" are arbitrable under the grievance machinery. The Board provided for arbitration as a means to settle grievances arising out of the application or interpretation of the contract between the parties.

The demand of the Smelters Union for severance pay was referred back to the Commission in accordance with its request.

The Board, with labor members dissenting, denied the union's request for a guaranteed weekly wage and a guaranteed work week of 40 hours consisting of five consecutive eight-hour days.

Getchell Sinks Shaft

Although the Getchell mine, which has been Nevada's largest gold producer in recent years, has closed its mill and has announced it will be closed until men and material for large operations become available, as well as gold mining restrictions lifted, it is increasing its already large ore reserves in the interim. It is sinking a deep three-compartment shaft through the wide zone of silicified limestone from which, during the past seven years, it has recovered about one-fourth of the state's gold output.

Tamping Bags Give Better Results In Many Ways . . .

Comparative tests by many mining companies have proved that by using bags— SEALTITE BAGS —a better tamp can be made easier and quicker than by using the old "bug dust—catch as catch can" method.

With a better tamp they get more safety—less fumes and smoke and less blown-out shots. The amount of explosive can be reduced and still bring down more coal per shot.

It's important to have uniformly sized bags—as near the bore hole size as possible as it gives a tighter tamp and prevents shots from blowing out. All SEALTITE bags are exact in size.

Have your company make a test. We will furnish the samples FREE. Write for them today.

TAMPING BAG COMPANY
MT. VERNON, ILL.

Tungsten Metals Ceases Operations

The Tungsten Metals Corporation of Ely has announced cessation of mining and milling operations at its mines and mill at Shoshone, 40 miles southeast of Ely. During the time of its operation, since 1936, the company has produced high grade tungsten concentrate to an amount exceeding $3,000,000 in value. The company has found it impossible to continue because of the many unfavorable operating conditions imposed, and an uncertain future market. Its mining and milling equipment have been sold, but the mining property ownership will remain with the corporation.

King & Queen Builds Mill

The King & Queen mine at Keystone, in Mineral County near Superior, Mont., which is under a 10 year lease to E. G. Smith, truck contractor, and Ross Roundy, superintendent of the Sunset lease, both of Wallace, is building a milling plant of 100 tons capacity near the mine. Construction of the mill is under contract to Henry Johnson of Wallace. The leasers have a vein of lead-silver ore 20 ft. wide of milling grade.

Lucky Friday Shows High Values

An outstanding mineral development in the Coeur d'Alene district during the present year has taken place at the Lucky Friday mine at Mullan, where a rich vein of silver-lead ore 20 ft. wide has been developed on the 1,000-ft. shaft level. Mine run of the ore as it is being shipped for treatment averages about $22.50 per ton mill feed in silver, lead, zinc and copper values. Principal values are in silver, averaging around 14 to 19 oz. per ton. The mine is owned by a local stock company.

CORRECTION

May, 1945, page 38, last paragraph. Capacity of the Sullivan Mining Company's electrolytic zinc plant should read 3,500 tons of slab zinc per month instead of 350.

Bauxite Found Near Salem

High-grade bauxite float has been found by the Oregon Department of Geology and Mineral Industries in several localities both north and south of Salem. Pieces of this float made up largely of gibbsite a well known bauxite mineral, are scattered widely over the surface, and also occur as nodules distributed in the overburden at places in the southern part of the Eola Hills and in several localities in the Salem Hills. Chemical analyses of this float show 50 to 60 percent alumina, 1 to 13 percent iron, and 2 to 6 percent silica. The Department has been searching for and investigating bauxite deposits for over a year.

As exposed in some roadcuts under this float material, low-grade high iron bauxite occurs as a bedded deposit several feet thick, similar in chemical characteristics to the ferruginous bauxite found in Washington and Columbia Counties and described in a recent report issued by the Department. Alcoa Mining Company is now making an extensive investigation of the Washington County deposits.

Samples so far analyzed by the Department indicate that the Salem low-grade ferruginous bauxite contains about 35 percent alumina, 20 percent iron, and 10 percent silica. Insufficient sampling has been done to predict what the average grade will be for all deposits.

From the small amount of field work so far done by the Department, the deposits in the Salem area appear to have large areal distribution and reserves may be extensive.

Wage Negotiations Completed

Keystone Copper Corporation, Copperopolis, Calif., was recently ordered to provide severance pay, shift premiums and collar-to-collar pay by the Non-Ferrous Metals Commission. This directive followed disputes between Keystone and the IUMM & SW, which was settled by negotiations after WLB had assigned a mediator. Demands for a closed shop and general wage increase of 17 cents an hour were withdrawn by the union following agreement by the company on maintenance of membership with a 15-day escape clause, severance, shift premiums and collar-to-collar pay.

Under the new agreement, workers with one or more years of service will receive one week's wages on termination of employment through a reduction of force or suspension of operation. Severance pay will be in addition to earned vacation pay. Extra pay at the rate of 4 cents an hour for the second shift, and 8 cents an hour for the third shift shall be paid night workers. Collar-to-collar pay is reported to sum up to approximately one-half hour's pay each day.

Mine Locomotives

(*Continued from page* 39)

rolling friction but primarily to increase the life and service of a shaft or axle by sealing in the lubrication and at the same time sealing out dust and dirt. The old open bushed bearings and journals gave lots of trouble from coal, brake shoe dust and sand; this has been cured by the sealed anti-friction types.

In connection with ball bearings, I was recently asked why those on a mine locomotive did not give the same length of service as on automobiles. The answer to this is that the statement is not true; the locomotive bearings give the longer service when measured by actual hours in use. An automobile may perhaps run three or four hours per day whereas a locomotive will run anywhere from 12 to 24 hrs.; consequently in one year the locomotive operates several times more hours that the average car during its entire life, since 100,000 miles at an average speed of 33 1/3 m.p.h. is only 3,000 hours of running. Another point about locomotives is that an idle shift usually causes greater wear on the bearings than the working shift. This of course does not apply where a locomotive sets stationary in the motor barn but usually on the off shift a motor is hauling supplies or running light from one part of the mine to another—operating at higher speed and consequently putting more wear on the running gear.

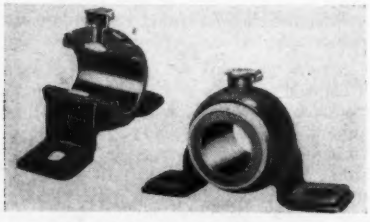
Haulage Equipment

In order to move a given tonnage of coal over a given distance and in a given length of time, the same amount of energy is required theoretically whether the haulage is by locomotive, belt or rope. In actual practice there is not a great deal of difference in the amount of electrical power used by each of these three types of equipment; the mechanical efficiencies are approximately equal and nearly similar proportions exist between power required for pay load, dead weight and friction. However, each one is especially suited for certain conditions and the gradient of the haulage road is the greatest factor in determining which equipment is best. For nearly level seams, locomotives and belts are both used but in this class of mines, and particularly for long distances, the locomotive predominates; for medium grades up to say 18 degrees the belt is fast coming into preference over ropes, while for steep grades the rope has the field to itself.

MANUFACTURERS FORUM

New Fan and Blower Bearing

A new low-priced bronze bushed bearing for small shafts especially adapted for fan and blower service, known as the Type "F" Bronzoil Bearing, has been announced by the Dodge Manufacturing Corporation of Mishawaka, Ind.



This bearing is said to be fully self-aligning. The inner housing is spherical to conform to a spherical socket in the formed steel outer housing which permits free self-alignment and avoids cramping the shaft.

A bronze capillary bushing which carries about one-third of its volume of lubricant is used as a liner. This bushing is provided with a shoulder which offers a broad, flat bronze bearing surface which is always lubricated and serves to reduce friction between the bearing and the collar which positions the shaft.

The bearing is compact. The frontal area which measures the obstruction to air flow has been considerably reduced which results in greater volumetric efficiency of the blower.

The provision for lubrication is simple and adequate. A liberal oil reservoir with a close fitting wick surrounds the bronze capillary bushing and supplies the required amount of oil as needed. Wick and oil cup are supplied with bearing.

All-Position Welding With A-C

The use of a-c welding, particularly for vertical and over-head work, has been hampered by the lack of an all-position a-c electrode capable of producing highest quality weld metal. An a-c electrode, known as the ACP, has recently emerged from Westinghouse laboratories. It includes an arc pacifier that prevents excessive spatter loss during the negative half cycles and an arc stabilizer to aid in reestablishing the arc after each current zero.

A high-organic electrode coating is used. This provides an envelope of burning gas that keeps the oxygen and nitrogen in the atmosphere from contaminating the weld metal. The coating leaves but a scanty slag over the deposited metal that does not interfere with welding. Obviously, d-c welding is easily performed in all positions but alternate half-cycles of a-c welding would be unsatisfactory. This restriction has impeded the progress of the much simpler a-c welding for some fifteen years. Good reverse-polarity (electrode positive), all-position, d-c electrodes have been available for years. The secrets of the prerequisite coating for all-position, a-c welding began to unfold some two years ago.

The coating of an a-c welding electrode must provide a number of indispensable factors: Protection from atmospheric gases; scanty slag; no slag interference with the arc; adequate drive and penetration without undue spatter loss.

In addition two factors of great importance in a-c welding are arc stabilizing and "arc pacifying." When the current goes through current zero, the arc is extinguished and the coating must provide an enveloping atmosphere of highly ionized gas so that the arc will restrike for the succeeding half cycle.

New Granite Surface Plate

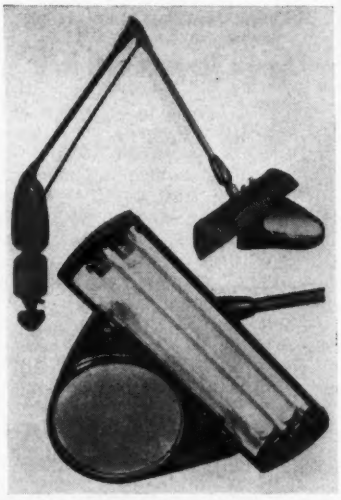
Accuracy to .0001 in. when gauging points, laying out drill jigs, dies and fixtures, is now reported possible with a granite surface plate announced by the Ideal Commutator Dresser Company, 1963 Park Avenue, Sycamore, Ill.

"Ideal" Surface Plates are made of Vermont granite, ground and lapped to precise tolerances. Having been thoroughly aged in the ground for many thousands of years, all internal stresses have been relieved, making it non-warping.

Granite is the third hardest natural substance known. The plates cannot be damaged seriously as nicks or scratches will not raise a burr and affect the accuracy. Having a low co-efficient of friction, tools and fixtures can be moved over the granite with ease. Being non-magnetic, the new plates will not attract and hold iron chips or dust.

New Aid to Close Work

An adaption of its "Super Sight" magnifier to fluorescent lighting has been announced by the Safety Division of the Boyer-Campbell Company,



Detroit, Mich. Magnifying lens and light assembly are mounted on a balanced bracket that can be placed in desired positions over a wide work area. Where it is used continuously as for reading a slide rule, detailed layouts, checking prints, etc., or in the shop; for work over a surface plate; on the bench, for checking verniers and micrometers; for inspection, in checking hardness cracks, etc., the cool fluorescent lighting is reported to add substantially to the comfort of the operator. "Super Sight" is supplied in three types of lighting: Standard bayonet type of bulbs; lamps that are sealed to relieve the explosion hazard; fluorescent lamps. It is also supplied with three types of brackets and two sizes of lenses so that it may be applied to most any industrial need.

New Safety Glove

A new safety glove made from high grade chrome-tanned cowhide is announced by the American Optical Company, Southbridge, Mass. Said to be ideal for welding, the new glove can also be worn for hand protection in other heavy-duty operations.

Principal feature of the new glove is its one-piece back construction. Be-

cause of this construction there are no seams on the back of the glove to catch sparks or molten metal.

The Gunn style of manufacture is said to reduce the number of seams to an absolute minimum. To give added strength and protection, all vulnerable seams are welted.

The new glove, according to the maker, is carefully designed and expertly made to give long hard wear on the toughest jobs.

Announcements

The first five-star "E" flag earned in that area is now flying over the plant of the **Union Wire Rope Corporation** of Kansas City, marking the start of the company's fourth year of outstanding production for the Navy.

* * *

The board of directors of **Wickwire Spencer Steel Company**, at a recent meeting, accepted in principle the proposal of the directors of **Colorado Fuel & Iron Corporation** for the merger of the two companies, and appointed a committee of the board, consisting of Messrs. E. C. Bowers and R. T. Dunlap, to negotiate a formal merger agreement with the directors of Colorado Fuel & Iron Corporation.

When a merger agreement has been approved by the directors of both corporations, it will, in accordance with applicable laws, be submitted to the stockholders of the respective corporations for their action.

* * *

For the fourth time since November 21, 1942, the **Macwhyte Company**, Wire Rope Manufacturer, has been cited for an outstanding achievement in war production with the award of the Army-Navy "E," symbol of excellence.

* * *

Nordberg Manufacturing Company, Milwaukee, Wis., announces return of G. J. Brown to active duty as manager (overseas) of its London branch offices. Also announced is the appointment of J. P. Burls, formerly chief engineer (overseas) to the position of South African branch manager.

* * *

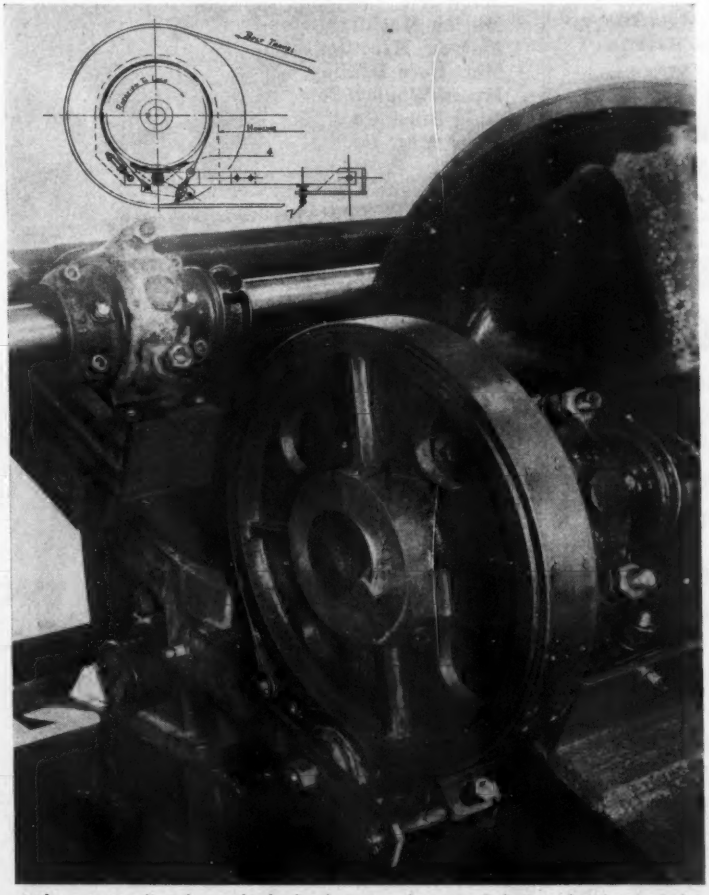
A. Milne & Company has been named national distributor for wrought iron bars manufactured by **A. M. Byers Company, Pittsburgh.**

* * *

A third star has been added to the Army-Navy "E" flag originally awarded in April, 1943, to the **Gould Industrial Division** of the **National Battery Company, Depew, N. Y.**

* * *

Joy Mfg. Co. has announced removal of its executive offices from Franklin, Pa., to 333 Oliver Building, Pittsburgh, Pa.



A shoe acting directly on the brake drum is a feature of the new band type belt conveyor back stop just announced by Barber-Greene Co., Aurora, Ill. The shoe is said to bring 18 to 20 percent additional drum circumference into contact and to reduce the resistance required of the brake band

CATALOGS AND BULLETINS

JACK MAINTENANCE & REPAIR MANUAL—Practical help on maintenance and care of lever and hydraulic jacks is found in the new 48-page Repair and Maintenance Catalog No. 45, just issued by *Templeton, Kenly & Co.*, 1020 S. Central Ave., Chicago 44, Ill.

The types of jacks covered include automatic lowering, mine timbering, car siding, geared, cable reel, cable tensioning, pole pulling, mine post pulling, pull rod, track, pipe pulling and pushing, journal, rail pulling and expanding, push and pull, mine roof and hydraulic jacks.

RUBBER PRODUCTS, the Fifth Edition of "Manhattan Rubber Products for Industry," a condensed catalog of mechanical rubber goods, has been completed by *The Manahattan Rubber Mfg. Division of Raybestos-Manhattan, Inc.*, Passaic, N. J. Copies are available on request. Described are many mechanical rubber products and special items. Particular emphasis is given transmission and conveyor belting, V-belts, hose, packing, molded rubber products, rubber roll coverings, tank linings, and abrasive wheels.

TRACTOR REPAIRS—A new bulletin GEA-3329, "How to Repair Tractor Parts by Arc Welding," is available by writing to *General Electric Company*, Schenectady, N. Y.

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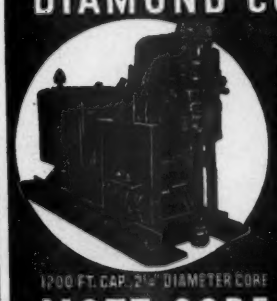
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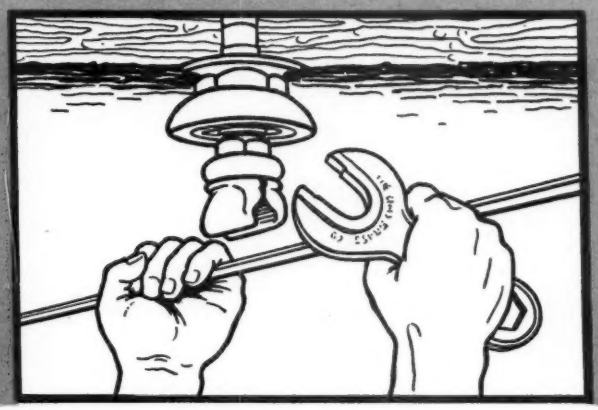

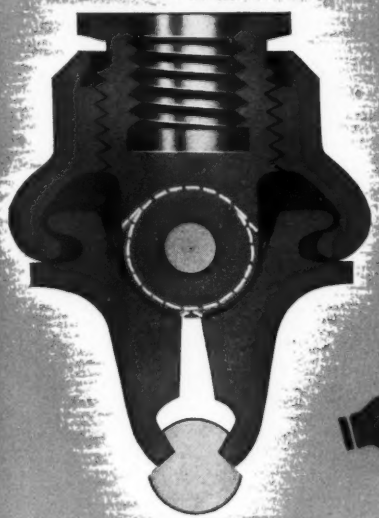

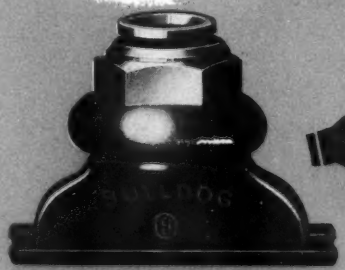

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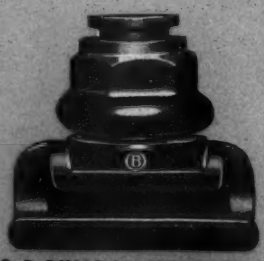

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